Digital devices 1

A digital device is an electronic device that uses digital data (such as 1s and 0s) as opposed to analogue data (such as a sound wave). Here are five commonly used types of device that you need to know about.

1 Multifunctional devices

These devices can perform multiple functions, such as inputting and outputting data.

An example is a touch screen, which outputs an image while allowing the user to input data by pressing the screen or a multifunctional printer.

Force feedback game controllers are multifunctional devices – they can input data and output vibration.

2 Personal computers

These are small and inexpensive computers for use by individual users.

Examples are desktops and laptops, which are more portable and have a built-in battery, screen and keyboard.

Web servers store web pages and online content, and serve data to users over the internet.

3 Mobile devices

Smartphones and tablets are made with portability in mind to give people computer and internet access while on the go.

4 Servers

These powerful computers provide services to other computers connected to a network.

An example is a mail server that provides access to email services for all the users on a network.

Links For more on networks, see page 17.

5 Entertainment systems

These are devices for watching TV/films (such as satellite or cable digiboxes), listening to music and playing video games.

Games consoles are entertainment systems with powerful graphics processors that allow users to play video games.

Now try this

Nadeem wants to access the internet while he is travelling to college by train.

(a) Give a type of digital device that would be appropriate for Nadeem to use.

(b) Explain two reasons why the device you chose is appropriate for Nadeem's requirements.

Concentrate on Nadeem's requirements, and the features he most needs when using a device while out of the house, on a train.

Had a look ☐ Nearly there ☐ Nailed it! ☐

Digital devices 2

Digital devices are often developed to make everyday tasks easier, quicker or more cost-effective and to provide efficient, improved access to data. There are four types of digital device that you need to know about.

1 Digital cameras

These capture images and videos digitally using an image sensor and store them as digital data on media such as a memory card or hard drive.

Examples are still and video cameras.

Links There is more about data storage on page 6.

2 Navigation systems

These devices use a GPS (Global Positioning Satellite) receiver to locate the user's position on a digital map and provide directions to a given destination.

An example is an in-car satnav which uses GPS location data with software to provide directions to a given destination when driving.

3 Communication devices and systems

These devices can send and receive analogue or digital data to and from another device.

Traditional analogue examples include phones and faxes.

A modern digital example is a router which directs data across a network.

WiFi dongles are communication devices that allow your PC to communicate with a router wirelessly.

4 Data capture and collection systems

These devices collect and input data through automated systems rather than direct data entry.

Examples include:

- a barcode scanner, which inputs (or reads) a barcode and converts the information into data
- an optical mark reader, which reads pencil or pen marks on specially designed printed forms, such as lottery tickets
- an EPOS (electronic point of sale) system, which records sales and updates stock levels.

An **RFID reader** reads data stored on a smartcard by being in close proximity to the card. These are often used by payment cards or for stock control.

Now try this

J P Lucy is a chain of small department stores, with five branches.

State two different data capture and collection systems that might be used in the department stores.

Questions with the command word 'state' don't require long answers. You can give your answer using single words or short sentences.

Uses of digital devices

Digital devices play an increasingly important role in many different areas of our lives. They enhance our social lives and make our work role more efficient. However, sometimes they also have the opposite effect.

Uses of digital devices

Here are some examples of how digital devices are used in six key areas of our lives.

The ability to access learning materials, submit work and communicate with tutors electronically makes e-learning a fully interactive experience.

The use of EPOS systems allows retail businesses to record sales, update stock databases and identify customer preferences.

Now try this

J P Lucy is a chain of small department stores, with five branches.

Explain how your choice of data capture and collection systems you have identified might be used in the stores and why they would be beneficial to the business.

This is the second part of the question you answered on the previous page. When explaining how J P Lucy might use the data capture and collection systems you identified, focus on the advantages of these systems. How do they help the business?

Had a look ☐ Nearly there ☐ Nailed it! ☐

Input and output devices

Peripheral devices are hardware devices that are not essential to the running of a computer system, but that connect to the system and provide additional functions. The most common types are input and output devices.

Links For more on accessibility devices, see page 5.

Input devices

Device	Features	Example uses
Keyboard	Made up of keys used to input alphanumeric characters and symbols.	• Writing a report • Inputting into a database
Mouse	A pointing device used to select items on screen.	• Navigating a user interface, e.g. by clicking on icons
Scanner	Converts hard copy text or images into a digital format.	• Inputting a photo for editing in graphics software
Graphics tablet	Controls the computer by using a stylus on a tablet.	• Creating digital illustrations
Microphone	Converts analogue signals (sound waves) into electrical signals to be sent to the sound card which converts analogue to digital.	• Talking on VOIP software • Voice recording
Webcam	Inputs video and still images directly into a computer.	• Video conferencing
Sensor	Takes and inputs readings from the physical environment, such as changes in temperature.	• Automated central heating systems • Security systems

Output devices

Device	Features	Example uses
Monitor	Outputs an image to the user, e.g. of the user interface, a photo or a document.	• Viewing the user interface • Watching movies
Projector	Outputs an image onto a wall or screen.	
Printer	Produces hard copies of digital documents and images on paper.	• A hard copy of a report • Printing digital photos
Plotter	This specialist type of printer draws to a very high quality on very large paper.	• Drawing vector graphics
Speakers	Amplify analogue signals (sound waves) sent from the sound card for the user to hear.	• Listening to music • Listening to someone during a VOIP call
Headphones	A portable alternative to speakers.	

Now try this

Marit is a graphic designer who produces posters and leaflets. She creates a lot of the digital illustrations for these herself.

State two input devices and two output devices, explaining how they would be useful to Marit in her graphic design work.

The question asks you to 'explain' your choice of input and output devices, so as well as naming the devices, you need to give reasons why they are useful to Marit.

Devices for accessibility and data processing

Peripheral devices have been designed to perform many specialist functions. Two important types are devices that aid accessibility to computer systems, and those that automate data processing for organisations.

Accessibility devices

Some peripheral devices are specifically created to allow accessibility for people with disabilities. For example:

- trackball – an easier-to-use alternative to a mouse, consisting of a moveable ball on a base
- touch screen or large key keyboard – useful for people unable to use a keyboard easily
- eye motion sensors and head motion trackers – used by people with significantly limited mobility
- Braille embosser – a type of printer that outputs text as Braille cells (characters).

Adaptive technologies

These are technologies that have been designed specifically to aid people with disabilities. They include both hardware and software.

Peripheral devices such as a trackerball or eye motion sensors are **hardware** – they are physical items that you can touch.

There are also many types of software available to aid accessibility, such as voice recognition software for input and screen reading software for output.

Manual and automatic data processing

There are peripheral devices which can automate the input and processing of data and avoid human errors such as typos during data entry. Some types of data collection, input and processing are more commonly done manually. Here are some examples of both.

Automatic processes/devices

- Biometric readers read fingerprints, hand prints or irises for use in personnel identification systems.
- Barcode readers read lines of different thickness and convert them into a string of values. 2D readers read more complex QR-style codes.
- Optical mark recognition (OMR) readers automatically read a form and input the data.
- Radio-frequency identification (RFID) devices are used in stocktaking and race timing systems.
- Smart meters accurately record electricity and gas usage and send readings to the energy supplier.

Manual processes

- Keying client or product details into a database.
- Entering customers' meal choices into a restaurant's system.
- Marking exam scripts.
- Entering survey responses from a form.

Now try this

Marcus has recently become visually impaired following an accident.

Give two peripheral devices that will allow Marcus to continue using his IT systems.

The question is specifically asking you to identify peripheral devices rather than software. But the peripheral devices you suggest may allow Marcus to use adaptive software.

Had a look ☐ Nearly there ☐ Nailed it! ☐

Storage devices

Storage devices are a type of peripheral device used for storing, backing up and sharing data, usually for individual use where a network is not available.

Hard disk drives ...

are magnetic storage devices, commonly used as the primary internal storage device but can be external.

Characteristics and limitations

- 👍 Large storage capacity (1 terabyte or more).
- 👍 Low cost on a per byte basis.
- 👍 Very reliable.
- 👎 Slower than SSDs at loading data.
- 👎 External HDDs are not as portable as some other options.

Solid state drives ...

are flash memory devices commonly used as the primary storage in portable computing devices like tablets and laptops.

Characteristics and limitations

- 👍 Very fast data read/write speeds.
- 👍 Low power consumption.
- 👍 Extremely reliable as they have no moving parts which can be damaged.
- 👎 Higher cost than HDDs on a per byte basis.
- 👎 Usually have a lower storage capacity.
- 👎 Only have a finite number of writes.

SD cards ...

are small flash memory cards that are commonly used for storage in digital cameras and some smartphones.

Characteristics and limitations

- 👍 Very small and portable.
- 👍 Easy to transfer between devices with SD card readers.
- 👎 Very small storage capacity, generally around 64gb – greater capacity is costly.
- 👎 Various 'enhancements' to the standards, resulting in potential compatibility problems, for example SDHC and SDXC.

USB memory sticks ...

are small flash memory devices that connect through a USB port.

Characteristics and limitations

- 👍 Extremely portable device.
- 👍 Compatible with most computer systems via USB ports.
- 👎 Storage capacity is low when compared to SSDs and HDDs.
- 👎 Only have a finite number of writes before they break.
- 👎 Because they are small, they can be lost easily.

Optical disks ...

such as CDs, DVDs and Blu-ray disks are used for software, music and movies.

Characteristics and limitations

- 👍 Small and portable.
- 👍 A lot of devices have built in capability to read optical discs, with external devices being inexpensive if needed.
- 👎 Archival stability of writable media can be questionable.
- 👎 Fragile and easy to damage.

Magnetic tape ...

is used for large data backups.

Characteristics and limitations

- 👍 Very large storage capacity.
- 👍 Very cheap on a per byte basis.
- 👎 Data is accessed serially which is very slow.
- 👎 Requires specialist equipment for recording and reading data.

Now try this

Explain two limitations of using a USB memory stick for transferring video footage and graphics between home and office.

Try to explain each limitation you identify in as much detail as possible.

Types of operating system

The operating system is what coordinates all the operations of your computer. It manages all the resources on the computer, such as the CPU and RAM, and controls the software and hardware. Without it, your PC would be useless.

Real-time operating systems (RTOS)

Inputs are processed and responded to instantaneously.

Why choose real-time?

- It provides fast response.
- It is best used where inputs must be processed and responded to immediately, such as traffic light and air traffic control systems.

Automatic braking systems (ABS) are an example of a RTOS. The system continuously processes input data to detect obstacles and apply the brakes to avoid collision as required.

Single-user single task operating systems

One user can use the system at a time, and one application can run at a time.

Why choose single-user single task?

- It requires fewer resources.
- It is best used on devices that have limited processing and memory, which could not handle running multiple applications, for example basic mobile phones or a simple handheld game (such as a Virtual Pet).

Single-user multitasking operating systems

One user can use the system at a time, but many applications can run simultaneously.

Why choose single-user multitasking?

- It allows the user to use several applications at once.
- It is best used on systems where a user needs to be able to switch quickly between applications, for example an office worker using a laptop or desktop PC.

Multi-user operating systems

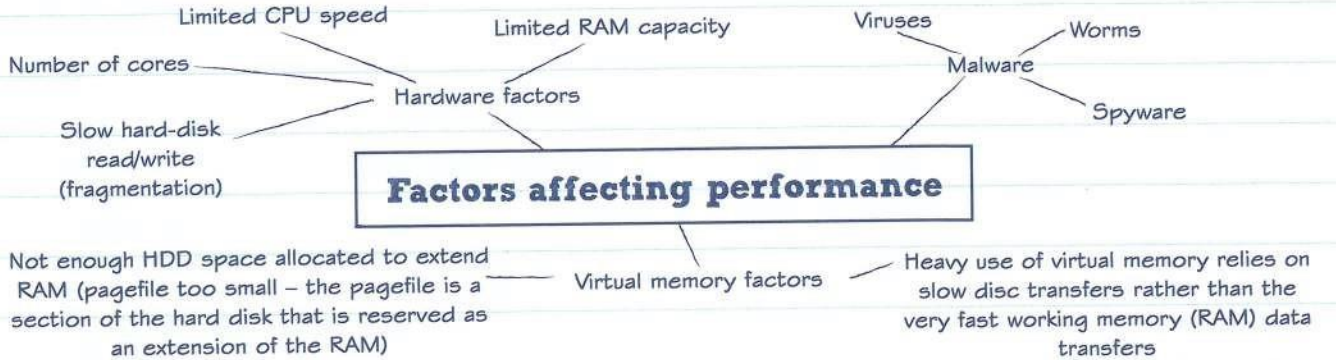
Many users can use the system at the same time and can run many applications simultaneously.

Why choose multi-user?

- Processing and resources can be shared by multiple-users.
- It is best used where many users need access to the same processing or resources at the same time, for example web servers.

Operating system performance factors

Operating systems require careful maintenance to keep them performing efficiently.



Now try this

Analyse the factors that affect the performance of an operating system.

You need to demonstrate your ability to use technical vocabulary. You should also cover a range of issues and not just one or two.

Had a look ☐ Nearly there ☐ Nailed it! ☐

The role of the operating system

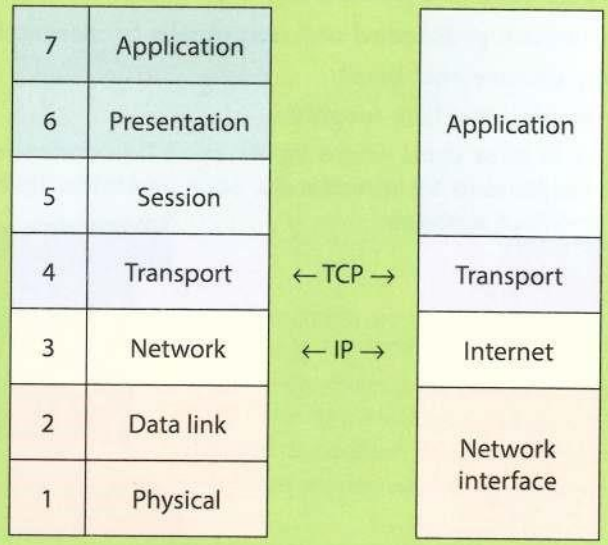
The operating system on a digital device is the link between the hardware and the software. It passes messages back and forth and carries out instructions from the software to the hardware.

Networking

Operating systems simplify networking in a computer. The operating system implements a number of networking technologies such as:

- the TCP/IP stack
- network utility programs such as traceroute
- device drivers for the network interface card.

The TCP/IP stack is the set of protocols used for transmitting data over the internet. The data transmission takes place in layers (or steps). The diagram shows how the TCP/IP stack links to the OSI model, which is the standard model used to explain how computers network.



Links For more on traceroute, see page 10.

Links For more on protocols, see page 19.

Security

A number of features are commonly built into operating systems to help improve security. These include:

- user authentication
- antivirus and firewall software
- backup facilities.

Memory management

The operating system manages the computer's resources, such as its memory.

To do this, the operating system decides and tracks:

- which processes to allocate memory to
- how much memory to allocate to each process
- when to un-allocate memory
- transferring data to the pagefile (or swapfile) on the HDD temporarily to free RAM (paging or swapping).

Multitasking

Most operating systems allow you to run more than one application simultaneously. To do this, the operating system must be able to allocate resources (CPU, memory, disk space) to each application in order to allow it to complete two or more tasks simultaneously.

Device drivers

An operating system comes with generic device drivers that work with a wide variety of different peripheral devices, allowing them to communicate with your computer. However, most hardware comes supplied with specific drivers to take full advantage of the hardware's capabilities.

Now try this

Describe the ways in which operating systems help to manage memory on an IT system.

Try to answer the question without looking at the information on this page. Then read the page again to check your answer.

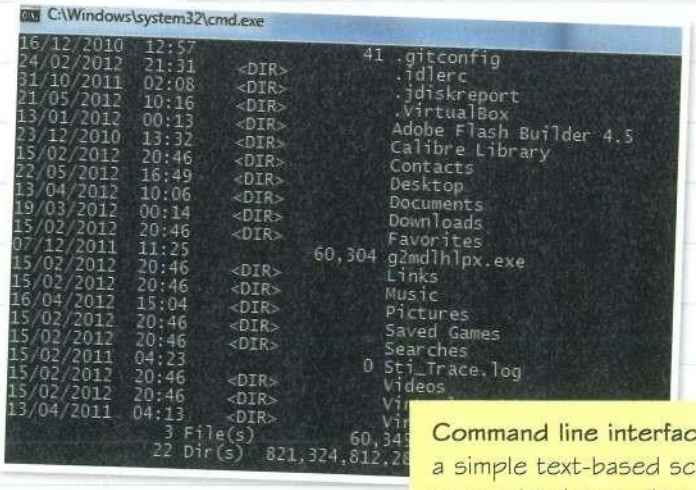
User interfaces

The user interface is a core part of any operating system. It allows the user to interact with the computer system and is the part of the software that has a huge impact on a user in terms of useability.

Command line interface (CLI)

The user interacts with the computer by typing in commands in response to prompts displayed on the screen.

- 👍 Experienced users find it quicker to complete tasks.
- 👍 Requires far less memory and processing power than GUIs to run.
- 👎 Requires knowledge of the specific commands for performing functions.
- 👎 Learning so many commands can be intimidating for inexperienced users.



Command line interfaces use a simple text-based screen to provide interaction.

Graphical user interface (GUI)

Users interact with the device by controlling a pointer or touch screen to select icons and menus displayed on screen. GUIs are widely used on devices from PCs to smartphones.

- 👍 This simple, intuitive method of interacting is easy for beginners to use.
- 👍 It doesn't require users to learn any commands to perform tasks.
- 👍 There are usually options to adapt the interface according to an individual user's needs, for example by using screen magnifiers or changing the colours or font sizes.
- 👎 It is often resource intensive, requiring a lot of processor power and memory.
- 👎 Experienced users can find it frustrating to complete tasks they could perform in a CLI with one command.

Menu-based interface

Users interact using a simple menu that presents options to choose from. An example is an ATM screen.

- 👍 The limited number of options makes it easy to use.
- 👍 It is often possible to figure out how to perform tasks without any instruction.
- 👍 They can include options to adapt the interface for an individual user's needs, for example by providing speech output or a choice of larger font size.
- 👎 Performing tasks can be slow and frustrating where many levels of options must be traversed.

Menu-based interfaces offer simple options to provide interaction.

Now try this

Rahul is an expert user of computer systems and has spent many years using different types of operating system user interface.

Explain why Rahul is more suited to using a command line interface.

Make sure that you explain what it is about Rahul that makes a CLI advantageous for him.

Had a look ☐ Nearly there ☐ Nailed it! ☐

Utility software

Utility software is used to manage system resources. Utilities are like a tool box to help us optimise and maintain our computer system. Many utilities are pre-installed as part of the operating system, such as traceroute, while others may be selected by the user and installed, such as antivirus scanners.

Disk utilities

Disk utilities are designed to maintain the performance of a computer's disk drive.

File compressors – backing up very large files and sharing them online can be difficult. This utility compresses files to reduce their size and decompresses them for later access.

Backup – you regularly want to back up your files, but this can be slow as a manual process. Backup utilities allow you to automate the backup process.

Disk defragmenter – over time a computer's disk drive becomes fragmented, which slows down file access. This utility reorganises the data for quicker access, but is only required on a HDD when using Windows (fat32/NTFS) file systems.

Network utilities

Network utilities are designed to maintain good network traffic and keep networks secure.

Firewalls – open networks are at risk from threats like hackers and worms. Firewalls prevent unauthorised access by monitoring and blocking suspicious traffic.

Antivirus – this utility prevents computers from receiving viruses and detects and removes viruses that have already infected a system.

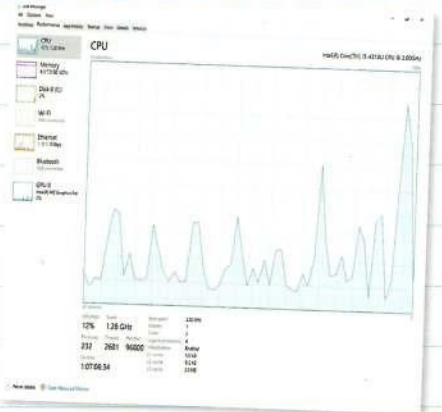
Traceroute allows you to display the path that data packets travel over an IP network to help diagnose problems.

Other utilities

There is a huge range of utilities which do not fall under a particular category.

Registry cleaners are designed for Windows systems to remove old, redundant registry entries. This can help improve system performance.

System profilers display a detailed breakdown of the system, including hardware and software. This can help with deciding where a system needs upgrading and diagnosing problems with the system.



System monitors monitor resources and performance of PC systems. They help identify the causes of poor system performance.

Now try this

Jessica wants to improve the performance of her computer system as it has been running slowly recently.

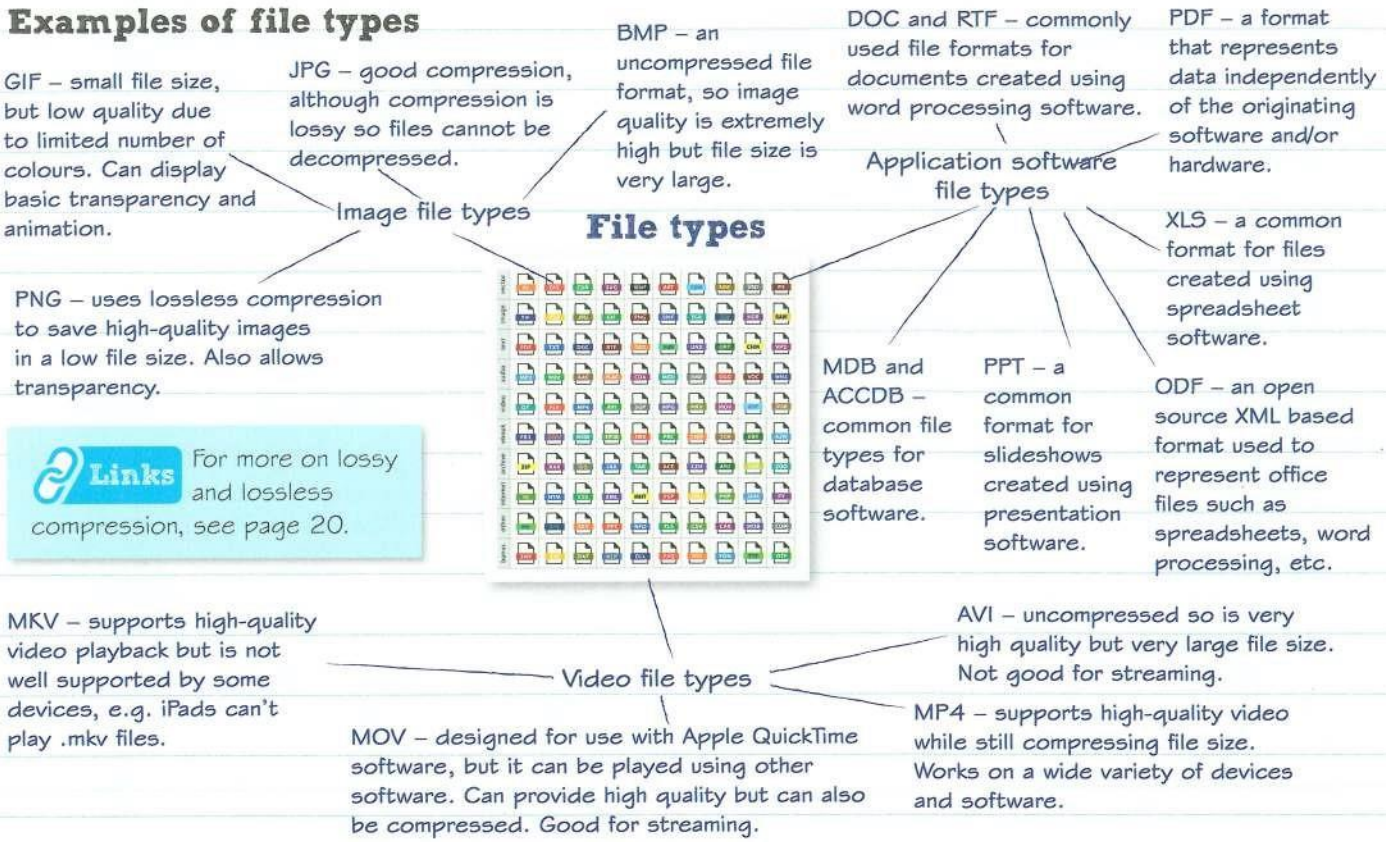
Analyse the features of two utility tools that would help Jessica improve her system performance.

The question asks you to 'analyse' rather than simply 'explain'. Make sure you clearly explain why each feature you identify would be useful for Jessica and how they would therefore improve the system's performance. You should also comment on how effective they might be.

File types

Different file types are used to denote the form, or structure, of the data stored within the file. The file extension tells the user what type of data the file should contain. It also tells the operating system which icon to display and which software to use to open the file when the user double clicks the icon.

Examples of file types



Links For more on lossy and lossless compression, see page 20.

Implications of file types

The choice of file type or storage method of data has ongoing implications for individuals and organisations, including:

Issue	Description	Why might this be an issue?
Compatibility	Some file types only work with certain software.	May need to purchase new software. Sharing files with others who do not have the required software.
Quality	Different image, video and audio file types provide varying levels of quality.	Choice will depend on intended use of the files – e.g. is high quality the priority or small file size?
File size	The file type affects file size – some types are very efficient in the way they store data whereas others use lots of storage space.	File size may have implications for storing, transmitting or displaying files.

Now try this

Kasim is making a website to advertise his wedding photography business and wants to know what file type he should be using to display his photographs.

Explain the benefits of using two different file types for displaying his images.

Think about the benefits of a jpg compared to a bmp or a gif.

Had a look ☐ Nearly there ☐ Nailed it! ☐

Application software

Application software allows end users to complete tasks, such as creating a report or a presentation.

Uses of application software

There are many different types of application software that have their own uses. These include:

Productivity software – these are applications like word processors, desktop publishers and spreadsheets that are used in office environments to support business tasks and improve efficiency.

Graphics software – these applications are used to edit photos or create original artwork.

Communications software – these applications make communicating quicker and easier. They include instant messaging, email and VOIP software.

Proprietary and open source software

These terms refer to who owns the source code behind the software.

Proprietary software

The source code is privately owned by the software company.

Users pay to buy or subscribe to the software.

👍 Support (e.g. for setup and troubleshooting) is provided by the software creators.

👍 It may have more features than open source software.

👎 The software company may be slow to provide updates and bug fixes.

👎 Software is usually very generic, with little scope for customisation due to copyright or complexity issues.

👎 It can be costly.

Open source software

The source code is available to read and modify.

👍 Most open source software is free to use, although many companies provide paid-for services to enhance and/or support open source.

👍 Support and fixes are provided by the community, often via forums.

👍 Open source utility software is usually compatible with other proprietary utility software.

👎 Support with fast response may not be available when needed, as it relies on goodwill.

👎 There may be indirect costs involved in paying for support and training.

Choosing software

When choosing software, consider:

- ease of use – familiarity and ease of use is paramount
- reliability – ensuring software works as intended and can be depended upon
- capability – that the software can do the job required of it and do it effectively.

Performance

When looking at performance, consider:

- the maturity of the software, as stable versions of software can be more efficient given there has been time for bugs to be resolved
- interoperability – interface with other devices or systems
- support of dedicated hardware for complex tasks.

Now try this

Seth is looking at different software options for managing orders and deliveries in his freight shipping business.

Analyse the relevant benefits and drawbacks to Seth of using an open source software application for meeting his needs.

This task requires greater depth as it asks for you to 'analyse'. Identify advantages and clearly explain why they would be useful for Seth, as well as how some drawbacks would affect him.

Emerging technologies

Emerging technologies are those that are currently in development and are just starting to make an impact on business and general society.

What are emerging technologies?

Some of the emerging technologies we see today include:

- artificial intelligence
- biometrics
- robotics
- virtual reality.

Virtual reality is an emerging technology set to make a big impact on how we entertain ourselves at home.

Emerging technologies at home and work

Emerging technologies are changing the way we live our personal lives and the way we do business. Here are some examples.

At home

Artificial intelligence in automated vacuum cleaners gives us more leisure time. Self-driving cars could soon make the roads safer.

Biometrics let us log securely into our tablets and smartphones through our thumb print.

Virtual reality is opening up new and exciting video gaming opportunities.

Domestic robots can carry out household chores or home security. Social robots provide companionship.

At work

Artificial intelligence used in business forecasts is helping in decision making.

Biometrics are increasing security at airports through facial recognition at passport checks.

Robots are performing dangerous jobs without risk to life. They can then carry out routine production line tasks, as well as delicate surgical procedures.

Virtual reality is allowing businesses to test products under development in a virtual environment.

Implications of emerging technologies

- The Internet of Things (IoT) allows your car to know where you are going and how to get there, and your fridge to pre-order your supplies, but all this needs data. Increasingly, advanced data-hungry technologies are placing a strain on the existing infrastructure.
- Society demands data wherever and whenever it likes – we are no longer confined to the home WiFi network or the office LAN. Location-aware technologies and the availability of 3D imagery means that data access is essential to maintain and develop the emerging world of virtual reality and autonomous systems.
- There are new ways of gathering data resulting in the emergence of 'big data' which means we need new ways of analysing it.
- New ways of identifying ourselves through biometric data also brings the need for greater and more powerful security.

Now try this

Liam has a small chain of petrol stations and wants to capture the buying habits of his customers so he has introduced a loyalty card scheme.

Explain what other measures Liam needs to consider so he can get useful marketing information.

Think about how Liam is going to collect data and what he will do with it. Explain the potential impact on his existing systems.

Had a look ☐ Nearly there ☐ Nailed it! ☐

Choosing an IT system

There are many factors to consider when choosing the best system for the end user, ranging from what the system needs to be capable of doing, to how the user interacts with it and what devices make up the system.

User experience and needs

- Is the user experienced with computer systems or do they need a system that is easy to use?
- Are they looking for performance, e.g. for video gaming, and need a system with a high specification graphics device?
- Is accessibility an important issue?
- Does the user need the system to be always available, even when on the go?

Specifications, compatibility and connectivity

- Does the system meet the specification requirements of the software to be used?
- Will the system work with other devices?
- Can the IT system use the required connectivity technology, e.g. for using mobile internet connections or syncing devices?

Cost

- Does the user have a large budget, allowing you to choose components from well-known brands?
- Do they have a small budget which requires looking for a cheaper alternative?

Efficiency and productivity

- Is the efficiency of the system a key issue?
- Do users need to be highly productive?
- Is it essential that the system is able to start up fast, load and save programs and files quickly, never stutter or crash or have any other problems?
- Does the user have the budget for the higher-end machines that provide greater efficiency?

Implementation

- What is the timescale for the IT system to be implemented?
- Does the system need to be available quickly?
- Will the system need extensive testing?
- Will you need to migrate data from an old system to the new one?
- Will users need training in order to use the system?

Security

- Will the system be handling sensitive information?
- Does it need biometric security for login or the ability to attach physical security such as locks?
- Are portable devices not appropriate because of the risk of them being stolen?

Now try this

Fraser has asked his friend Benjamin to advise him on a new IT system for playing high-end online video games.

Explain two factors that Benjamin has to consider when choosing an IT system for Fraser.

Look through all the factors listed on the page. When you have chosen the two you think are most important, make sure you explain their relevance to the case study.

Wired connection methods

Wired methods of connecting devices are any method that uses physical cables to connect between devices, systems or components. Different types of connection rely on widely differing connectors, depending on what the signal or data is transmitting.

Wired system connection methods

	Uses	Advantages	Limitations
Cat5	Telephone communications and ethernet networks.	👍 Versatile and widely available. 👍 Cheap compared to other networking options.	👎 Only useful over shorter distances. 👎 More susceptible to interference than other wired techniques such as fibre.
Coaxial	All types of data communication, commonly used in television cabling.	👍 Less susceptible to interference than UTP/STP so works over longer distances. 👍 Cheap, though not as cheap as UTP/STP.	👎 Thickness of cable makes it difficult to work with. 👎 Limited bandwidth.
Fibre optic	Telephone and internet cables, cable television and computer networking.	👍 Improved security as the cable cannot be tapped. 👍 Can be used over long distances. 👍 High data transfer rate.	👎 Very expensive. 👎 Specialist skills needed to install.

Wired device connections

	Uses	Advantages	Limitations
VGA	Analogue connection of video display equipment, such as projectors, CRTs or LCDs.	👍 Universally used on high-resolution display equipment. 👍 Low-cost cabling.	👎 Cumbersome cabling. 👎 Signal affected over distance (noise). 👎 No DRM (digital rights management).
HDMI	Digital connection of both video and sound from devices to display equipment.	👍 Capable of 8k (and beyond) resolution. 👍 Used in computing and entertainment.	👎 Limited length. 👎 Cabling and technology is more expensive than analogue equivalents such as VGA.
USB/ FireWire	Connecting equipment and peripherals, such as printers, scanners, input devices, cameras.	👍 High speed capability. 👍 Backwards compatibility. 👍 Can connect multiple devices.	👎 Limited distance. 👎 Limited power supply.

Now try this

Meera wants to connect her new laptop to the large 4k LCD Touchscreen TV in the conference room to allow her to collaborate with colleagues on product development.

Describe what wired connection methods Meera should consider to get the best out of the system.

Make sure you consider ALL aspects of connecting the screen to Meera's computing equipment and how she might make use of the display as both an input and an output device.

Had a look ☐ Nearly there ☐ Nailed it! ☐

Wireless connection methods

Wireless connection methods connect using the electromagnetic spectrum. This may be traditional radio waves or even light waves.

Wireless system connection methods

	Uses	Advantages	Limitations
WiFi	To connect devices wirelessly to local and wide area networks such as the internet.	High data transfer speeds. Good range. Relatively cheap to install.	Can be complex. Security concerns.
3G/4G/ WiMAX	To connect to data networks such as the internet whilst on the move.	Allows true mobility. 4G provides for very fast connection speeds.	Heavy data usage can be costly. Uses public networks.
Satellite broadband	Provides connectivity to remote areas, often rural.	Wide coverage. High speed.	High latency. Subject to weather conditions.
Microwave/ Laser	Allows point-to-point LAN connections between locations.	High speed. No ongoing costs.	Affected by poor weather. High initial cost.

Wireless connections methods for devices

	Uses	Advantages	Limitations
Bluetooth	For pairing devices over short distances, such as wireless headphones, watches, keyboards and mice.	Easy to set up. Low power consumption.	Low data transfer speeds. Very short range.
WiFi Direct	For connecting devices to remote displays.	Can transmit both audio and video. Usually built in to devices.	Limited range. Can affect data connectivity (interference).
WiFi	Allows 'ad-hoc' networks to permit wireless printing/ scanning, for example.	Simple setup. Uses existing WiFi infrastructure.	Using ad-hoc networks can impact connectivity.

Now try this

Shaheera wants to set up a local area network in her home to allow her to share an internet connection and files between her different devices.

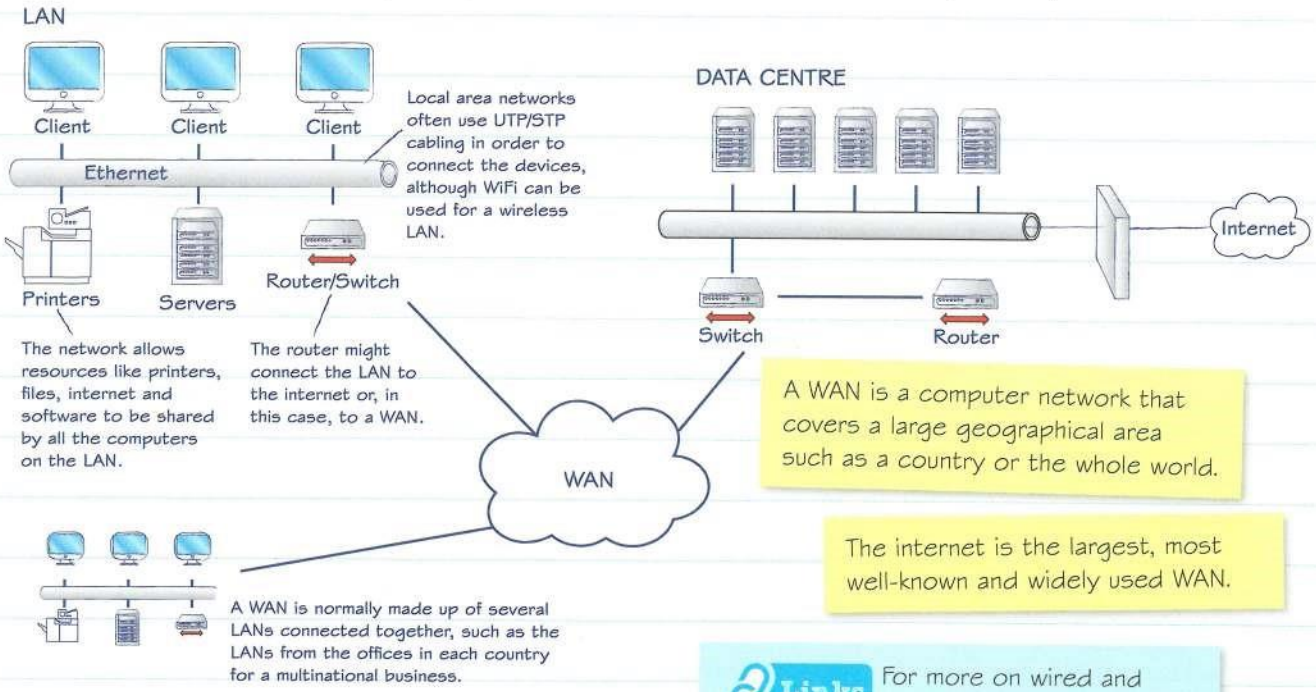
Explain two benefits of using WiFi for her home network.

Make sure you compare WiFi to other methods of connecting Shaheera's devices, both cabled and other wireless methods.

Features of different networks

Different types of network can be defined by their size (personal, local, wide area networks) or by their purpose (virtual private networks).

Local area networks (LAN) and wide area networks (WAN)



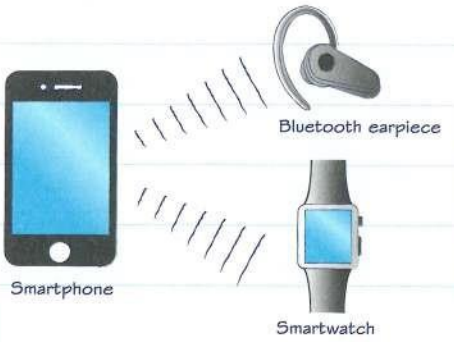
A WAN is a computer network that covers a large geographical area such as a country or the whole world.

The internet is the largest, most well-known and widely used WAN.

Links For more on wired and wireless connections, go back to pages 15 and 16.

A LAN is a computer network that covers a single building or site.

Personal area network (PAN)



A PAN is used to network devices wirelessly within a short range of an individual.

Bluetooth is commonly used to create a PAN to connect all the digital devices in a person's workspace, for example connecting a mobile phone to a Bluetooth headset for hands-free operation.

Virtual private network (VPN)

This network technology creates a secure network connection over a public network, usually the internet, by using encryption.

This allows a business to have a secure wide area network without having to pay the high costs of constructing the physical network infrastructure, as they can use the existing internet infrastructure.

Links For a diagram of a VPN, see page 20.

Now try this

James is considering whether he should use his home's wireless network or use Bluetooth to allow him to connect his PC, smartphone, printer and smartwatch.

Explain what the differences are in terms of the type of network (PAN, LAN and WAN) and what he should consider when making his decision.

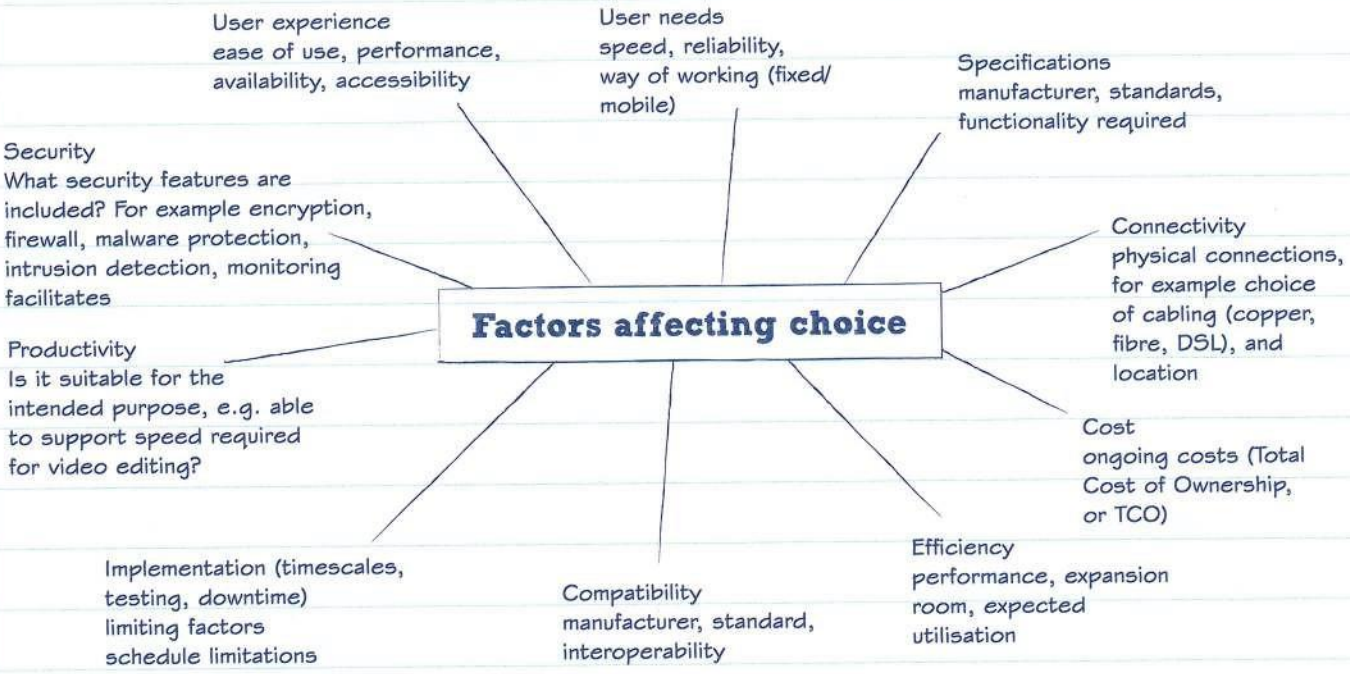
Make sure you cover three different factors and link them to the features of PANs and LANs.

Had a look ☐ Nearly there ☐ Nailed it! ☐

Network choice and performance

Networks are all around us and are as unique as the users who use them. There are many factors and reasons for selecting the various components that make up a network.

Factors affecting choice of network



Choosing components

Consider:

- manufacturer – is there an affinity to a particular manufacturer? What is the corporate policy?
- specification – what kit meets the needs and supports required features?
- warranty/ongoing support – corporate level of support? SLA? Response times?
- adherence to standards – will it work well with existing components?
- familiarity – are there specific skills that in-house staff possess?
- infrastructure – what does it have to fit into, for example incorporate existing Cat6 cabling?

Performance factors

Consider:

- available bandwidth and connection methods
- load – is the demand likely to be 100% loading the components (how much 'wiggle room' is there)?
- professional level equipment or SOHO equipment?
- infrastructure – is it being used on ageing infrastructure?

Now try this

Jane's graphic design business is expanding and she is recruiting two new graphic artists and moving into a small unit.

Explain two factors Jane should consider when choosing a network infrastructure.

Don't forget to think about the future. How might Jane's business continue to grow and what impact might this have?

Protocols

Protocols are the rules that define methods of communicating data between two or more digital devices. They ensure that the transmission of data always follows a set procedure. There are different protocols for different applications.

TCP/IP

Transmission Control Protocol and Internet Protocol are used together as the basic communication language of the internet.

Data sent over the internet is broken up into 'packets' to enable it to be sent more efficiently. Each packet is sent individually and then reassembled at the destination.

- TCP is used to create the packets and reassemble them at the end.
- IP is used to route packets to the intended computer, using the computer's IP address.

Links Have a look at the diagram of the TCP/IP stack on page 8.

Email

SMTP – the Simple Mail Transfer Protocol is used to transfer emails between mail servers. It is also used to transfer email from the client software to the outgoing mail server.

POP3 – the Post Office Protocol 3 is used to retrieve emails from the mail server. It allows us to download messages to our client software for offline reading.

IMAP – the Internet Message Access Protocol is used to retrieve emails from the mail server. Rather than downloading the messages, IMAP syncs them with the mail server.

Voice and video calls

Many companies use their own proprietary protocols for voice and video calls over the internet. Some well-known protocols are:

H.323 – this was one of the first successful VOIP protocols and is recommended by the ITU (International Telecommunication Union). It defines the rules for communicating audio and video over packet switched networks.

SIP – the Session Initiation Protocol is used to create, control and end VOIP connections.

RTP – the Real-time Transport Protocol is designed to transfer audio and video over IP-based networks.

Web pages

HTTP – the HyperText Transfer Protocol is used to allow web servers and browsers to transfer files over the internet. It is how we access the World Wide Web.

HTTPS – the secure version of the standard HTTP. It uses public key cryptography to encrypt communications between a web browser and server.

FTP – the File Transfer Protocol is used to transfer files over a network. It is the technology used to upload files to a server as well as to download large files.

Security protocols

SSL (Secure Sockets Layer) and TLS (Transport Layer Security) are used to ensure that transactions over networks are kept safe. SSL is gradually being phased out and replaced with TLS.

Now try this

Alex is a business executive who uses email as her main means of communication. As she has to travel a lot she needs to use her email on several different devices.

Evaluate the protocols used for receiving emails and which would be most beneficial to Alex.

There are two protocols to talk about for this question. Look at the case study – one protocol is certainly more useful to Alex than the other. Remember, when you are asked to 'evaluate', you need to review the information so you can give a supported judgement about the topic or problem. Often, a conclusion will be required.

Had a look ☐ Nearly there ☐ Nailed it! ☐

Data transmission issues

Data transmission is an important part of computer use. It involves sending digital messages between devices in a network, such as in a LAN or over the internet. Here are the main issues associated with data transmission that you need to know about.

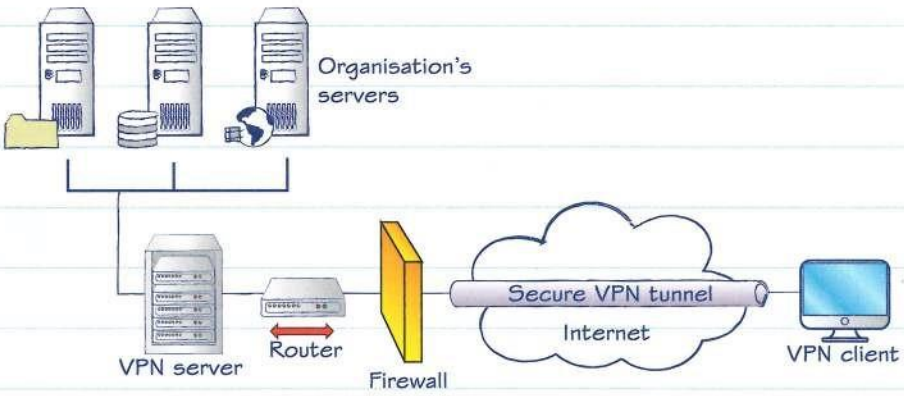
Security considerations

User authentication – usernames and passwords authenticate users who have permission to use a network and prevent unauthorised access by hackers.

Firewalls – these monitor traffic to prevent unauthorised access and dangerous data packets being passed into the system and causing harm.

Encryption – information can be intercepted while being transmitted. Using encryption ensures intercepted data cannot be read. HTTPS is a commonly used method for secure data transmission.

VPNs and security



VPNs create a secure connection between remote sites and users over the internet to prevent data being intercepted and read.

Bandwidth and latency

Bandwidth is the rate of data transfer over a network – usually measured in bits per second.

Latency is the time delay for a data packet to transfer to its destination – usually measured in milliseconds.

Bandwidth and latency implications

Browsing the internet doesn't need an instant response so latency isn't a big factor. Bandwidth is an important factor as it affects how long files take to download.

Online gaming needs very low latency as players need a fast response for real-time updates of character movements, etc.

Video calls need low latency and high bandwidth as you need to transfer a lot of data (video and audio), but you also want a fast response to avoid stutter.

Compression

Compression reduces file size so files can be transferred faster. Compression is used for images to be displayed on the Web, video and audio in streaming and VOIP, and documents attached to emails. There are two main types of compression.

- Lossy – data removed during compression is permanently deleted. Commonly used in images, audio and video.
- Lossless – all original data can be recovered when uncompressed. Commonly used for documents.

Codecs

A codec is a program used to compress and decompress video and audio files. This reduces the space they take up on disk and allows fast transfer over a network, such as the internet, for VOIP calls and online streaming.

This leads to a loss of quality in the video or audio – in the resolution, frames per second or both.

Now try this

Joanna is a big fan of online video games. She is currently experiencing a lot of skipping. She has a high bandwidth connection and thinks the problem is the latency.

Describe how bandwidth and latency would affect Joanna when playing video games.

Make sure you relate your answer to the context of video gaming.

Features of online systems

Cloud storage is a method of storage where data is stored on remote servers, rather than on the user's local computer or in an organisation's own data centre. Similarly, in cloud computing, software is stored on remote servers and accessed by users via their browser.

Uses of ...

cloud storage

Personal use

- Storing files such as photos and videos online, so they are synced and accessible on all the user's devices.

Professional use

- Storing off-site backups of business data, to allow recovery in case of loss of data.
- Accessing business documents while working off-site.

cloud computing

Personal use

- Accessing graphics editing software, email and home office software on a variety of home computing devices.

Professional use

- Accessing office applications and email without having to install the software on all workstations.

The impact of cloud storage and computing ...

on individuals

Advantages
👍 Data can be accessed on the wide variety of devices used in the home.
👍 Software with specification requirements that are too high for a home computer can be easily accessed through cloud computing.
Disadvantages
👎 Cloud storage and computing can make heavy use of bandwidth.
👎 Hackers could access and misuse personal photos or videos on the cloud storage servers.

on organisations

Advantages
👍 Off-site backups are more physically secure (e.g. safe from fire).
👍 A business can subscribe and unsubscribe to software according to changing needs.
👍 Organisations can save money as IT staff are not needed to manage software installations and less powerful hardware is required.
Disadvantages
👎 Organisations have no control over the security of their backups, as that is controlled by the cloud storage company.
👎 Privacy concerns over who can access the organisation's data within the cloud storage company.
👎 Software is inaccessible if there is a network outage.

Now try this

Kyle uses his smartphone to take photos and videos, which he normally stores on his device. He has a mobile 3G internet connection, and he has decided he would like to use cloud storage to save his photos and videos so he can instantly access them on his PC when he gets home.

Explain two implications of using cloud storage for Kyle.

Note that Kyle is using a mobile internet connection. What are some of the issues with this that could impact on uploading videos to cloud storage?

Had a look ☐ Nearly there ☐ Nailed it! ☐

Using online systems

Using online systems, such as cloud computing and storage, can offer big benefits to organisations and individuals. However, there are factors that must be considered before switching to these online systems to ensure it is the best decision for an organisation.

1 Security

Online systems create security concerns as data is accessible over the internet, potentially to hackers, and you have little control over security procedures.

If security is important, choose an organisation that implements high security protocols.

2 Cost

There is a great range in the costs for online services. Many cloud storage services are free of charge to individual users up to a certain data limit, but charge monthly fees for businesses.

There are free services available to organisations, which can save a lot of money, such as Google Drive (although if you want to impose things like corporate control and policies, costs are involved).

3 Ease of use

Some online services are easier for non-technical users than others. Cloud storage systems often sync your data with your computer, allowing you to access your cloud files using the same interface as for your local files.

Also check on the amount of technical support available to users.

4 Features

Cloud software sometimes has fewer features than a locally installed version. However, there are a wide range of options available, as cloud services allow users a lot of choice in finding a suitable product.

5 Connectivity

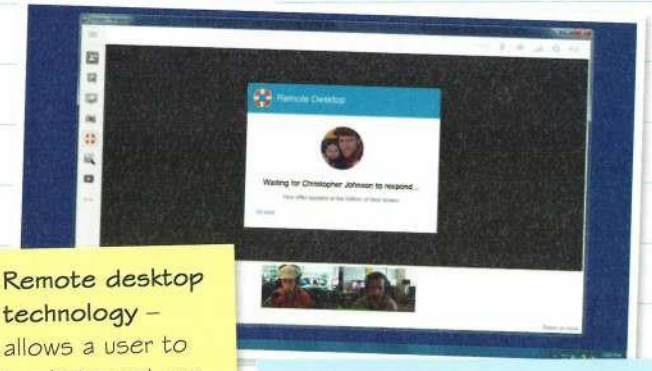
Cloud-based storage and software require internet connections in order to access the services.

You may be limited in your options if your internet connection is slow or if you have a limited data allowance.

Remote working

Online systems allow people working from home, or anywhere outside the office site, to access the network of the organisation they work for. Systems that help with this include:

- VPN – allows a secure connection to be made to the organisation's network over the internet.
- Remote desktop technology can also be used to fix computer problems remotely, and is often used by technical support departments to promote a more effective way of working.



Remote desktop technology – allows a user to log in to and use their work system from a remote device.

Links For more on VPNs, see pages 17 and 20.

Now try this

Kasia is looking into switching to a cloud-based office software service for her small business.

Explain two factors that Kasia must consider before switching to an online service.

Always read the question carefully. Make sure your answers are relevant to cloud software and not cloud storage.

Online communities: methods of communicating

An online community is a group of people who communicate over the internet about common interests. We use a wide variety of different online services to form and participate in these online communities.

Here are six commonly used types of online community.

1 Social media

Social media sites, like Facebook, are used to share content and communicate with others. A key part of this is creating groups, often based around locations, events or hobbies, to communicate news and stories with others who share these interests. There are also professional media sites, such as LinkedIn.

2 Blog

Blogs, microblogs (snippets of information rather than longer posts) and vlogs (video blogs) let people regularly share information, such as news and opinions, with others on a topic of interest.

Others can then comment on the videos or blog posts to create a dialogue between people with shared interests.

3 Wiki

Wikis are created and maintained by online communities. Groups of people with shared interests add and edit content on a site to ensure the information is up to date and accurate.

For example, you can find a dedicated wiki for most popular video games, movies and TV shows.

4 Chatroom/instant messaging

- A chatroom is a website where users can communicate by posting short text messages. These are viewable by everyone on the chatroom.
- Instant messaging also lets users write short text messages but directly to a person or a group of selected people, so it is slightly more private.

5 Podcasts

Podcasts are audio (and sometimes video) files posted to the internet for download. They are normally produced as a series on a particular topic. People interested in the topic can subscribe to the podcast to get the latest episode.

6 Forums

Also known as a message board, a forum is a website used for online discussion where users can post messages and questions publicly for other users of the site to read and respond to.

Forums are usually based on a topic of interest, such as technology or particular hobbies.

Now try this

Amit is a big fan of football and wants to be able to chat with others about his favourite team.

Describe three different methods for Amit to get involved in an online community.

There are lots of different options here. Make sure you mention examples of how Amit would use each type of online community you identify.

Had a look ☐ Nearly there ☐ Nailed it! ☐

Online communities: implications

Both individuals and organisations make extensive use of online communities. This has had many implications on how we live our lives and how we work. Many are positive but some are negative.

Implications of online communities for individuals and organisations

Now try this

A business is considering implementing a forum to provide customer support and to allow customers to feed back on products.

Explain two impacts for the organisation of implementing a forum.

Try to think of both positive and negative implications for the business.

You aren't asked to make a recommendation for the business, but bear in mind what you might recommend if this was an 'analyse' question.

Threats to data, information and systems

Using information technology systems to store and transmit information in digital form always comes with threats to the security and privacy of the data being used.

1 Malware

This is software designed to cause harm to your IT system, such as deleting, altering or stealing data.

2 Hackers

A person who exploits weaknesses in IT systems in order to gain unauthorised access is known as a hacker. This can be done to steal, alter and delete data from your system. (There are also 'ethical hackers' who are employed by companies to test defences and security.)

3 Phishing

A phishing email is one that pretends to be from a reputable company in order to get individuals to reveal personal information.

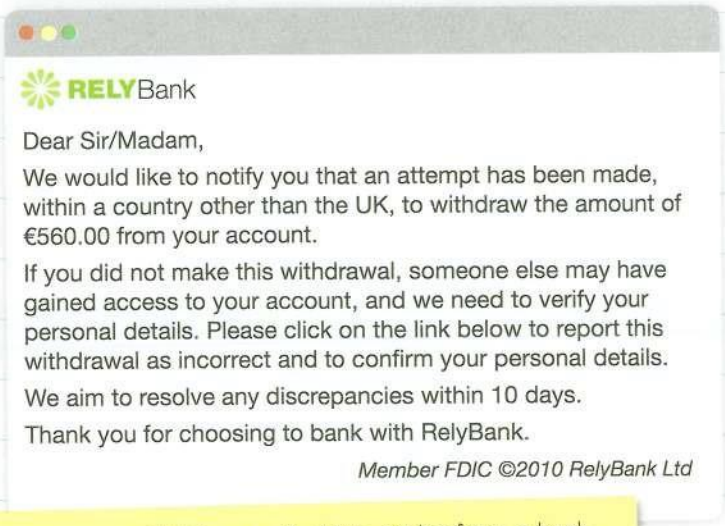
4 Accidental damage

Not all threats to individuals and businesses are malicious.

A lot of damage is caused through human error, such as accidentally deleting or overwriting files on a computer, or spilling a drink on a device and damaging it.

Examples of threats to data and systems

Viruses, worms, trojans and spyware are all examples of malware.



RELYBank

Dear Sir/Madam,

We would like to notify you that an attempt has been made, within a country other than the UK, to withdraw the amount of €560.00 from your account.

If you did not make this withdrawal, someone else may have gained access to your account, and we need to verify your personal details. Please click on the link below to report this withdrawal as incorrect and to confirm your personal details.

We aim to resolve any discrepancies within 10 days.

Thank you for choosing to bank with RelyBank.

Member FDIC ©2010 RelyBank Ltd

A common **phishing** email claims to be from a bank. It instructs the user to click on a link and enter their bank details, supposedly for verification purposes, but really to steal the person's bank details.

The impact of threats on individuals and organisations

The impact on individuals	The impact on organisations
• Identity fraud – the stolen personal information is used to open bank accounts, obtain loans, take out mobile phone contracts, etc. • Bank fraud – a criminal user gains access to your bank account and uses it to withdraw cash and purchase items.	• Loss of reputation – a business affected by any of the issues will lose the confidence of customers, who will turn to other businesses that haven't been affected. • Loss of income – during the down time caused by many of these threats, a business will not be able to carry out its normal business practices.

Now try this

Henley Investments is a finance company that provides investment advice and financial portfolio management services. Given the sensitive nature of the financial information that the firm manages using IT systems, it is concerned about threats to its systems.

Analyse the impact that threats to data security might have on Henley investments.

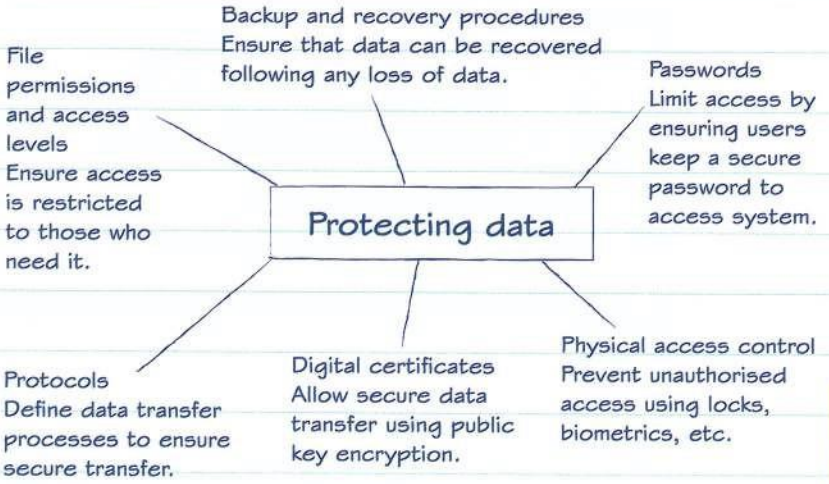
You need to fully describe each threat you identify and examine its potential impact on Henley Investments.

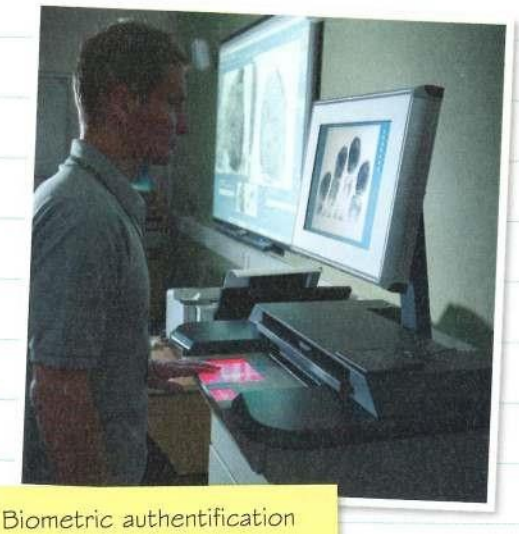
Had a look ☐ Nearly there ☐ Nailed it! ☐

Protecting data: tools and techniques

There are many tools and techniques we can use for protecting data stored and transferred using IT systems. Software and hardware tools are one important approach, as well as techniques and processes for limiting access and securing data.

Techniques for protecting data





Biometric authentification identifies individuals' unique fingerprint patterns.

Tools for protecting data

Tool	Description	Reason for using	Need to be aware of
1 Antivirus software	Detects and removes viruses and other malware from a computer system.	Protects systems from all forms of malware.	Must be regularly updated as new viruses are created regularly.
2 Firewalls	Monitor network traffic into and out of an IT system; block suspicious traffic to prevent unauthorised access.	Firewalls are key in preventing hacking attempts as well as worms.	Firewalls are not 100% effective – security holes can be exploited, e.g. in outdated software.
3 Encryption	The conversion of data into an unreadable code known as ciphertext.	The most effective form of security, as encrypted data cannot be read without the encryption key.	Encryption keys must be maintained and kept secure. A lost key means the data is irretrievable.

Encryption of stored and transmitted data

- We encrypt our hard disk so that anyone who gains access to our system (a hacker, or someone accessing a stolen device) cannot read our stored data.
- We encrypt data while it is being transmitted so that if it is intercepted it cannot be read.

Now try this

Highcastle Advertising is an advertising agency that works with companies requiring high levels of security for their new products.

Analyse two techniques that Highcastle Advertising can use to keep their data secure.

As well as naming and describing the techniques, identify how each one protects the data and the implications it has for Highcastle Advertising.

Protecting data: legislation and codes of practice

Data protection is supported through legislation. Non-compliance is very serious and can be punished with large fines and imprisonment.

Legislation for protecting data

The main data protection laws are the Data Protection Act 2018, which superseded the Data Protection Act 1998, and which is an extension to the EU General Data Protection Regulation (GDPR), and the Computer Misuse Act.

	Role	Impact on organisations	Impact on individuals
Data Protection Act 2018	• The main UK legislation for protection of personal data. • Protects the privacy of individuals' personal data held by others. • Gives rights to individuals on what data is collected and how their data is used.	• Increased costs to meet requirements for data security. • Limited in how much data can be gathered and how it is used. • Fines of up to £17 million if in breach of the law.	• Personal data collected by others is likely to be kept secure and not be misused. • Compensation can be claimed for any harm caused due to misuse of an individual's data.
Computer Misuse Act 1990	• Protects against attacks on IT systems used to gain unauthorised access and steal or cause damage to data. • Covers threats like hacking and spreading malware.	• Organisations' computer systems are more secure due to the deterrent of legal repercussions for attacks on systems. • Requires organisations (and their employees) to develop and adhere to effective security policies.	• Provides protection from attacks to an individual's computer systems. • Those who carry out attacks can face unlimited fines and up to 10 years in prison.

Links For more on legislation associated with IT systems, see pages 38 and 39.

When data protection fails

In 2007, families in the UK were informed of a potentially massive fraud alert. This happened after two computer discs which held the personal details of all UK families with a child under 16 went missing.

The Child Benefit data included name, address, date of birth, National Insurance number and, in some cases, bank details of 25 million people and 7.25 million families.

On behalf of the government, the then chancellor, Alastair Darling, issued an apology and an emergency statement in which the incident was described as a 'catastrophic' failure.

Codes of practice

Professional bodies and the Information Commissioner's Office (ICO) define codes of practice for how organisations handle, share and protect data.

Codes of practice are not legal requirements – they are best practice guidelines, which aim to:

- help support compliance with the Data Protection Act 2018, Computer Misuse Act and other related legislation.
- ensure data is not mishandled, which would lead to a negative impact on an organisation's reputation
- give individuals confidence that the data they supply to organisations will be safe.

Now try this

Susan is completing a registration form to sign up for an online retail site. In the process she is providing a variety of personal information to the business gathering the data.

Describe how two pieces of legislation help to protect Susan's data.

Make sure you name each piece of legislation before you describe it. Identify an impact of each law on Susan's situation.

Had a look ☐ Nearly there ☐ Nailed it! ☐

Features of online services

Online services are information and services that are made available over the internet, usually via a web browser. As a result, access to these services is extremely flexible and convenient.

Examples of online services

Some features are common to all types of online services. These include 24/7 access and availability on a wide range of devices. Others are more specific to different types of service.

1 Retail

- E-commerce sites
- Online auctions

👍 Wide range of competition to choose from.
👍 Saves transport time and costs.
👍 Better targeted marketing can be performed online.

👎 Products and services may not be regulated.
👎 May result in nuisance emails and texts.

2 Financial services

- Online banking
- Online trading

👍 Can manage finances from home.
👍 Reduces the need for visiting financial institutions to conduct business, resulting in reduced travel times and costs.

👎 Not all services may be genuine.
👎 Potential for unauthorised access through security breaches and social engineering.

3 Education and training

- Distance learning degrees
- E-learning new skills

👍 Can learn in your own time.
👍 Access to a wider range of courses than those taught in the local area.

👎 Need to make sure the course is properly accredited.
👎 Lack of structure may impede learning.

4 News and information

- Traffic reports
- Weather reports
- News websites

👍 Provides the most up-to-date information possible.
👍 Helps to plan travel and events to avoid traffic, bad weather, etc.
👍 Can be personalised to show news on particular topics.

👎 Need to check the reliability of the information provider.
👎 Too much information is accessible too quickly, for example potential impact and prejudgment of the accused before trial.

5 Entertainment and leisure

- Music/video streaming
- Online gaming

👍 Access to a wide range of music, TV and films for low subscription cost.
👍 Can play games with people all around the world.

👎 Safety locks may be needed to protect children from unsuitable content.

6 Productivity

- Cloud computing software
- Communication tools (e.g. video conferencing, email)

👍 Accessible anywhere with an internet connection and on most connected devices.
👍 Supports collaborative working, sharing information and communication.

👎 Potential for the loss of the 'human touch' by using technology to communicate and plan in isolation.

7 Booking systems

- Transport
- Hotels
- Appointments

👍 No need to travel to make booking.
👍 Fewer admin staff needed to take bookings.
👍 Avoids having to wait in a telephone queue (e.g. for GP appointment).

👎 May disadvantage those without internet access.

Now try this

Analyse the implications of different online services.

Not all implications are positive. In your answer to an 'analyse' question you'll be expected to discuss both the positives and negatives.

Business uses of online services

Some of the business uses of online services are collaborative working, the collection of transactional data and targeted marketing.

Collaborative working online

Online services such as cloud computing and VOIP allow people to collaborate on projects over the internet.

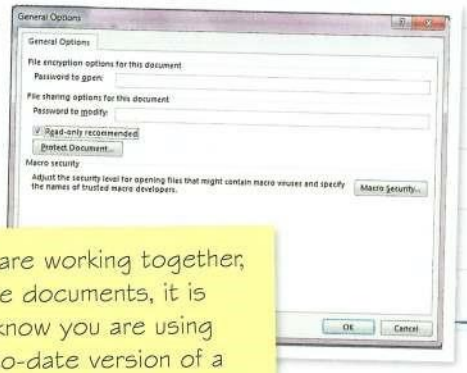
- ✓ Users in different locations can work on the same project.
- ✓ Users do not need to travel to work together, saving money, time and the environment.
- ✓ Users can work on the same document instead of on different versions.
- ✓ Users can use shared workspaces even though geographically separate.

Version control

This is important because it means a user knows which is the most up-to-date document to use. It is especially important when using collaborative working.

Version control can be managed by:

- locking the file and making it 'read only' while one user is viewing or editing it
- using software that allocates version numbers and dates of editing.



When people are working together, using the same documents, it is important to know you are using the most up-to-date version of a file or folder.

Transactional data

Businesses collect data from transactions made by their customers.

Examples of online transactions are purchases from retail sites and use of banking services.

Loyalty cards allow collection of data from purchases made in store as well as online. Cookies are used to track browsing habits and target advertising.

Uses of transactional data

Transactional data can be used to:

- ensure specific marketing
- analyse trends so that there is enough stock available to meet forecasts
- plan the workforce (particularly for service industries).

Targeted marketing

- This is used to target specific demographics, such as a particular age, gender or shared interest groups.
- It uses 'likes' to tailor marketing.
- It is relevant to recent search or browsing activity.

Businesses can use targeted marketing to reach very specific groups or even individuals.

Now try this

Meera produces customised gifts for all sorts of celebrations and is hoping to be able to concentrate on this full time.

Describe how Meera might use online services most effectively to increase her orders?

For questions like this you should suggest a few alternatives and highlight the reasons why the one you think is most effective would be the best one.

Had a look ☐ Nearly there ☐ Nailed it! ☐

Uses and implications of IT systems

IT systems have been developed for use in many different ways by different types of organisation and business. Their impact is far-reaching in all areas of work.

Organisational uses and implications of IT systems

The table gives examples of uses of IT systems in organisations and some typical implications of those systems on the organisations using them.

IT system	Features and implications
1 Stock control	👍 Automatic stock reordering. 👍 Accurate stock levels recorded. 👎 Can be expensive and may require staff training.
2 Data logging and analysis	👍 Highly accurate recordings. 👍 Doesn't require humans to log data. 👍 Automatic processing of data and output in different formats. 👎 Requires persistent data connectivity to provide real time telemetry.
3 General office tasks	👍 Improves efficiency and quality, e.g. in reports, presentations, spreadsheets. 👎 May require training of staff. 👎 IT support teams needed to correct issues and maintain software.
4 Creative tasks	👍 Makes it easier to edit film, music and artwork. 👍 Many ways of sharing creative work, e.g. video and image sharing websites. 👎 Files from creative tasks, such as film editing, require large storage capacities. 👎 Piracy concerns.
5 Online advertising	👍 Allows very specific targeted marketing based on users' browsing habits. 👍 Very cost-effective with a variety of payment methods, such as cost-per-click, cost-per-impression and cost-per-lead. 👎 Difficult to choose the best site for your adverts from the huge choice.
6 Manufacturing	👍 Improved efficiency – robots don't take breaks or make mistakes. 👍 Hazardous tasks can be performed by machinery. 👎 Loss of jobs in manufacturing, and can be very expensive to implement. 👎 Cannot deal with exceptions easily.
7 Security	👍 Includes technologies such as swipe cards and biometrics. 👍 CCTV monitoring and video technologies require fewer staff patrolling. 👎 Often expensive to implement these security systems due to the use of specialist hardware and often bespoke software solutions. 👎 Privacy concerns.

Data logging systems can be used in hazardous conditions or places humans cannot access, for example geolocators to log the path of migrating birds.

Now try this

Lisa runs a small cake company that specialises in bespoke cakes for both personal and corporate customers. At the moment, she doesn't use computers at all and estimates the cost of each cake.

Describe two ways that Lisa could use IT systems to help her develop her business.

Don't forget to look specifically at what impact your suggestions might have on Lisa's business and why.

Impact of IT systems on organisations

The potential of IT systems to enhance and improve businesses is obvious but there are many things to consider before embarking on the introduction of new IT systems in any organisation.

Impact of IT systems

User experience – does technology enhance what the users already do?

- Will it be easy to use and also be intuitive?
- Will the system increase performance and be reliable and available as users expect?
- What about users with additional needs?

Employee/customer needs – are people more productive and feel that the technology is helping them (or hindering them)?

- Losing touch – are businesses losing that personal touch in the quest for ever more efficient working?
- Big Brother – do customers and employees feel 'monitored' in a negative way?

Cost – how much is it going to cost, can this be related to the benefit received?

- Ongoing costs – maintenance, redundant systems
- People costs – training, skilled technical personnel

Implementation – how long might it take to put into place? How is the 'changeover' going to happen?

- Timescales and downtime – how long is it going to take? Is there a Plan B? How is downtime of existing systems (ways of working) going to be minimised?
- Testing – how is the system going to be tested thoroughly? Who is testing and how?

Replacement/integration with current systems – where does a system fit into the bigger picture?

- Will it work with existing systems?
- What about existing data? Customer records, sales records, financial records
- Productivity – how does a system help a business meet its goals more effectively?
- Automation – reduce 'human error', increase efficiency

Working practices – what impact will it have on ways of working, people, processes?

User support and staff training needs (initial and ongoing) – is there a cost to train and upskill staff?

- Staff culture – how will staff accept new IT systems?
- Staff skillsets – does the level of technical and support expertise required change?

Security – how is sensitive data protected? Is it secure?

- Compliance with new legislation
- Public relations risk of data breaches

Now try this

Ayisha has a business operating three supermarkets. She is looking at how she can use ICT in order to make the running of the supermarkets more efficient, as well as how to expand her business.

Describe two potential uses of online services to help Ayisha achieve her goals and describe how they might impact other areas of the business.

When describing a use don't forget to include how a potential service might be implemented and use the checklist above to identify other stakeholders.

Gathering data

Organisations need to gather data for a wide variety of reasons. One of the most common reasons is to find out what their customers want and what they are prepared to buy.

Sources of data

When gathering data we can collect it from two different sources. These are:

- Primary – data is gathered directly from the source, for example using a survey or from sensor readings.
- Secondary – this is data that already exists, for example from previous research, books, journals or reports. It could also be data on shopping trends (bought from a market research company).

Data reliability

For data to be useful, it must be reliable.
For data to be judged reliable it must be:

- Complete – all the data must be there. For example, sales data that misses a month's results could lead to incorrect decisions.
- Accurate – the data must be correct and truthful. This is easier to achieve from primary sources; secondary data must be from a trustworthy source.

Collecting primary data

Here are three common ways of carrying out a survey.

Surveys are an excellent method of gathering primary data. The organisation gathers the data itself, so can be sure it is reliable.

1 Questionnaire

This comprises a series of questions, usually close-ended with checkbox answer options. Traditional paper formats or electronic questionnaire websites can be used.

👍 Allows you to gather information from a large audience in a short space of time.

👍 All respondents get asked the same questions, giving consistency to data.

👎 The traditional closed questions don't offer any explanation of answers, while remote questionnaires may be misinterpreted by users resulting in less reliable data.

👎 Response rate is usually very low.

2 Interview

This is a focused one-to-one meeting with an individual where an interviewer asks questions. This could be face-to-face, over the phone or online using video conferencing.

👍 Follow-up questions can be asked, giving more detailed understanding of answers.

👍 Personal contact can elicit greater honesty from the respondent.

👎 It takes a significant amount of time to gather data from a range of people.

👎 Data is less quantitative than from questionnaires and so harder to analyse.

3 Focus group

This type of survey involves a group of people who are invited to take part. The participants answer questions and share ideas by engaging in conversation.

👍 It is quicker to gather information from a large group than from individuals.

👍 Respondents react to each other's answers, providing very detailed data.

👎 Assembling a group of people at the same time can be difficult.

👎 As with interviews, the qualitative data can be hard to analyse.

Choose two sources from questionnaire, interview or focus group. Make sure you look at both the advantages and the disadvantages of each.

Now try this

Haldtech Ltd is developing a new product in order to enter the mobile computing market. It needs to find out what its potential customers are looking for.

Analyse two primary sources of collecting data that Haldtech Ltd could use in order to find this out.

Processing data

Data is invaluable to organisations and individuals. It is used to make decisions, spot trends, gain competitive advantage and to monitor progress. It is at the heart of a modern company.

Importance of data accuracy

Inaccurate data can be a serious problem for organisations and individuals, as it leads to incorrect decisions being made. For example:

- incorrectly recorded stock levels could lead to ordering too little or too much stock
- inaccurate traffic information could lead to being late for an interview.

Methods of ensuring data accuracy

IT systems allow us to apply automated checks on data being entered. These do not ensure the data is 100 per cent accurate, but they do ensure it is sensible and matches the original source.

A validation error message

Method	Checks carried out	Examples
Validation ensures data entered is sensible and reasonable.	Type check – data must be the correct type.	Date in a date of birth field.
	Range check – numerical data must be between set values.	Age must be between 18 and 65.
	Length check – data must be less than or greater than a certain number of digits.	First name must be less than 15 characters.
	Format check – data must be in the correct predefined format.	Postcode must be LLN NLL.
Verification ensures data entered matches the original source.	Double-entry check – data must be entered twice, and both entries must match.	Entering a password twice on a registration form.
	Proofreading check – data must be read through to ensure there are no data entry errors.	A checkbox asking you to confirm data entered is correct.

Extracting and sorting data

1. Data is extracted from unstructured sources, such as web pages (web scraping), emails and documents.
2. The data is entered into a system for processing.
3. The data is stored in a database program to add structure.
4. The database can be sorted and searched using SQL queries.

Numerical and data modelling

- Data modelling ensures that the database is correctly structured, allowing the data to be efficiently processed.
- Correctly stored data can be used in numerical modelling. This involves simulating systems to help analyse data and make predictions, such as weather models used to forecast future weather patterns.

Now try this

A new social media site has a registration page that allows users to sign up to use its services.

Describe two validation methods and one verification method that could ensure data is correctly entered into the form.

Make sure your examples are relevant to the sort of data entered into a website registration form.

Had a look ☐ Nearly there ☐ Nailed it! ☐

Data presentation and trend analysis

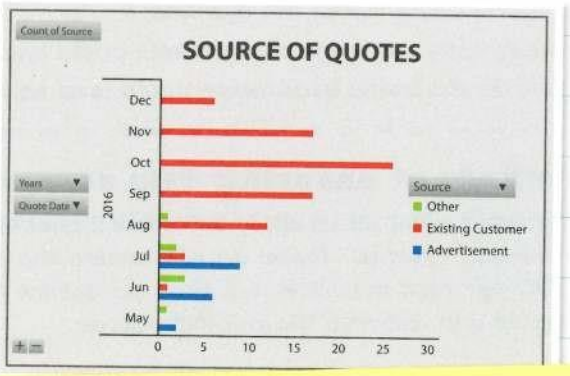
Data that is presented effectively can be interpreted easily and used to identify trends. Poorly presented data can waste time and not provide the information needed.

Data presentation

Data is meaningless unless it is presented in a way which allows decision makers to use it to inform their decisions. There are many tools available to present data.

	A	B	C	D	E	F
1	Quote Date	Quote No	First Name	Surname	Total Cost	Source
2	09/05/2016	1	Angela	Birkenshaw	£ 350.00	Advertisement
3	13/05/2016	2	Amy	Farmer	£ 459.00	Other
4	28/05/2016	3	Simon	Richards	£ 1,366.40	Advertisement
5	04/06/2016	4	Mitesh	Khan	£ 1,058.40	Advertisement
6	11/06/2016	5	Albert	Tattersall	£ 1,117.60	Advertisement
7	15/06/2016	6	Stephen	Hetherington	£ 642.06	Advertisement
8	16/06/2016	7	Imran	Patel	£ 950.00	Advertisement
9	21/06/2016	8	Ali	Zafar	£ 459.00	Other
			Jordan	Bamber	£ 1,117.60	Advertisement

Data presented as text is not particularly easy to digest but it does offer some advantages: it is straightforward to find the detail of the thing you are analysing without having to interpret pictorial representations.



Charts allow you to immediately get a 'feel' for the data. Extremes can be seen at a glance and businesses can identify trends.

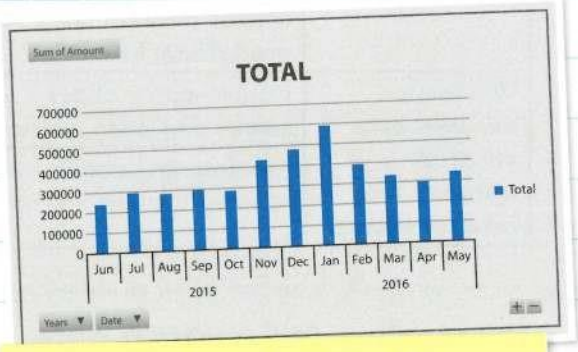
There are a wide range of charts available including line, bar, pie, scatter, radar and surface.

Trend analysis

Businesses that can identify trends quickly and easily are the ones which stay ahead of the competition. The more data that is available, the more accurate and valid the trends should be.

	A	B
1	Date	Sales Amount
2	06/06/2015	5,950.00
3	05/06/2015	6,800.00
4	15/06/2015	6,885.00
5	04/07/2015	6,885.00
6	29/06/2015	7,225.00
7	01/08/2015	7,290.00
8	20/08/2015	7,290.00
9	24/09/2015	7,290.00
10	19/10/2015	7,290.00
11	03/06/2015	7,650.00
12	07/06/2015	7,650.00
13	15/08/2015	7,650.00
14	16/06/2015	7,820.00
15	22/06/2015	7,820.00

A large dataset is meaningless at first glance. A company owner would spend a long time searching through to identify trends by looking at figures alone.



However, by changing the data and performing some grouping, and presenting it in a graphical form, you can see that sales peak during the winter months.

This analysis of trend data allows an organisation to plan things such as staffing and stock. More detailed data allows for more detailed predictions. It may be that sales of certain products peak at certain times of year.

A 'pivot chart' could combine sales data and cross-reference sales per month with individual product lines in order to identify which lines perform well, or not, at different times of year. Pivot charts are excellent at combining massive data sets to compare two (or more) variables.

Now try this

Frank owns a small café in the city centre and often needs to take staff on at short notice to meet demand.

Describe how Frank might use the data he already has about sales to forward plan his staffing levels.

Think about what tools Frank could use and how he might present data in different ways to help him forecast his business's trading patterns.

Presenting data and results

User interfaces of database systems are used to collect data for processing and to output the results to users, so that they can interpret and use that data. How effectively the data is presented affects how useful it is to an organisation.

Presenting data and results

Relational database applications and spreadsheets are used to present information in a variety of formats. This could include:

Tabular data – tables can be formatted, sorted and searched to produce outputs.

Graphical data – a variety of formatted charts to present information in an easy-to-interpret format.

Error reduction

A good user interface helps to reduce errors when data is inputted, for example by:

- automating certain aspects, for example by providing dropdown list boxes, spinners and checkboxes to enable data entry without typing
- labelling input areas so users know what to enter in each box
- providing warnings when incorrect data is entered
- using techniques such as colour to indicate data entry.

Ease of use and accessibility

A user interface needs to make it easy for users to navigate, input data and receive outputs, regardless of disability, such as limited motor function or visual impairment.

Intuitiveness

An intuitive user interface allows users to easily work out how to use both the interface and the data it provides without a lot of training.

Clear navigation, good labelling and choosing the right output formats all help to improve intuitiveness.

Functionality

The user interface must allow an organisation to make use of the data stored in the ways that it requires. For example, the organisation may wish to carry out certain types of calculation or produce specific types of report. For instance, a report detailing items that are out of stock, rather than just a full stock report, allows for more efficient working.

Performance and compatibility

A system needs to be able process the inputs to the user interface and present outputs quickly. Poor performance leads to frustration and reduces productivity.

The system needs to be compatible with other systems that either input data into the system or receive outputs from it.

Now try this

A business needs to store data from a customer satisfaction survey it performed in order to process and present the results.

Explain two characteristics of a user interface that will help make it easier for the business to input the data.

Give explanations that are relevant to the type of data that might be collected from a customer satisfaction survey.

Had a look ☐ Nearly there ☐ Nailed it! ☐

Moral and ethical issues 1

The use of IT systems has changed how we live our lives and do business, with both positive and negative effects. As a result there are different moral and ethical issues which both producers and users of IT systems need to consider.

Environment

- The ever-growing demand for electronic devices means increased manufacturing output and increased energy needed to run the devices.
- These have negative by-products such as greenhouse gases which affect climate change.

Our constant need to update IT systems has led to increasing amounts of 'technotrash' in landfills.

Unequal access

Not everyone has access to IT systems and the internet.

- There is a distinct divide between access in countries in the developing and developed world.
- Many schools and colleges make resources available online. Students who do not have computer access at home may be disadvantaged in their learning.

Online behaviour

Netiquette describes acceptable behaviour on the internet. It attempts to solve problems such as:

- the perception of the internet as an impersonal and anonymous place to communicate, leading to unacceptable behaviour online
- trolling and cyberbullying on social networking sites, which also affect people's offline lives.

Globalisation

Globalisation describes the process of countries becoming increasingly interconnected, particularly the increase in trade, transport and communications.

- IT systems have played a key role in facilitating this process.
- Despite obvious benefits, globalisation has also caused or exacerbated problems such as job outsourcing, disease spreading, environmental damage and terrorism.

Freedom of speech

Some users of sites, such as social networking, blogs, vlogs and forums, express views that many people find offensive.

- Many sites set rules for the content added by users and for user behaviour, and close down accounts, groups and pages that are in breach of these rules.
- Some users feel this is a form of censorship and a violation of their freedom of speech.

Acceptable use

Many companies have acceptable use policies that define how employees can use IT systems, such as websites and email while at work.

Employees who use IT systems for activities not allowed under acceptable use policies can be subject to disciplinary action.

Now try this

Explain two moral and ethical issues faced by people who use IT systems in order to express their views online.

Look at the issues identified on this page and choose the two that are most relevant to this particular use of IT systems.

Moral and ethical issues 2

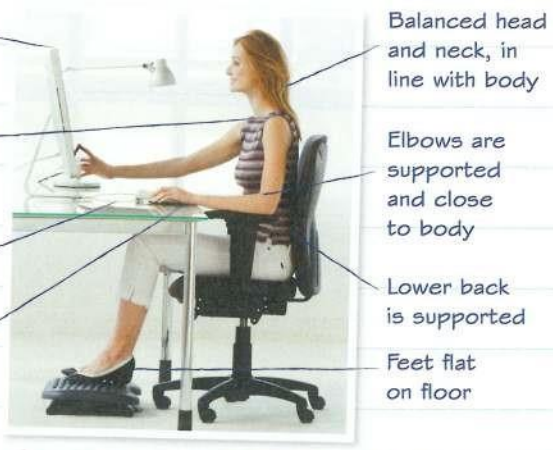
Many of the issues that arise from the use of IT systems are covered by legislation (see pages 38 and 39) but there are also moral and ethical concerns associated with these issues.

Health and safety

Health and safety issues associated with IT systems include the risk of repetitive strain injury (RSI), eye and back problems.

Employers have a moral responsibility to carry out risk assessments and provide suitable equipment and working conditions for employees.

Providing ergonomic workstations is part of an employer's duty to its employees.



Copyright

Illegally downloading movies, TV shows, music and software has become more prevalent with the growth of IT systems and services such as bit torrents and online streaming. Likewise the availability of images on the internet increases the risk of people infringing copyright in their work.

These practices threaten the livelihood of the people who produce these works, and those who sell and distribute them.

Protection of data

Organisations and individuals have an ethical responsibility to protect the data of other people that they are using, storing and transmitting.

Computer misuse

Attacks on computer systems, such as viruses, hacking and denial of service (DoS) attacks cause harm to individuals and businesses.

The effects can include loss of income for businesses, loss of jobs, theft of personal wealth, and the upset resulting from the inability to use our IT systems.

Links For more on computer misuse see pages 25, 27 and 38.

Links For more on data protection see pages 27 and 38.

Privacy

Privacy can be compromised by IT systems. Many of us use social networking sites, blogs, online messaging, email and a wide variety of other services to share large parts of our lives online. The growth of services, such as location aware targeted advertising and software, blurs the lines between our online and offline worlds.

The misuse of this information can have severe negative impacts. Cyberbullying, identity theft and bank theft are examples.

Accessibility

New IT systems should be accessible to people regardless of disability.

Inaccessible systems cause upset and stress, and can deny access for people with disabilities to work, services and leisure facilities.

Links For more on accessibility see page 39.

Now try this

An online business gathers personal information on its customers when they register for their website. They also record information on customers' buying habits while using the site.

Explain two moral and ethical issues the business needs to consider when gathering this information.

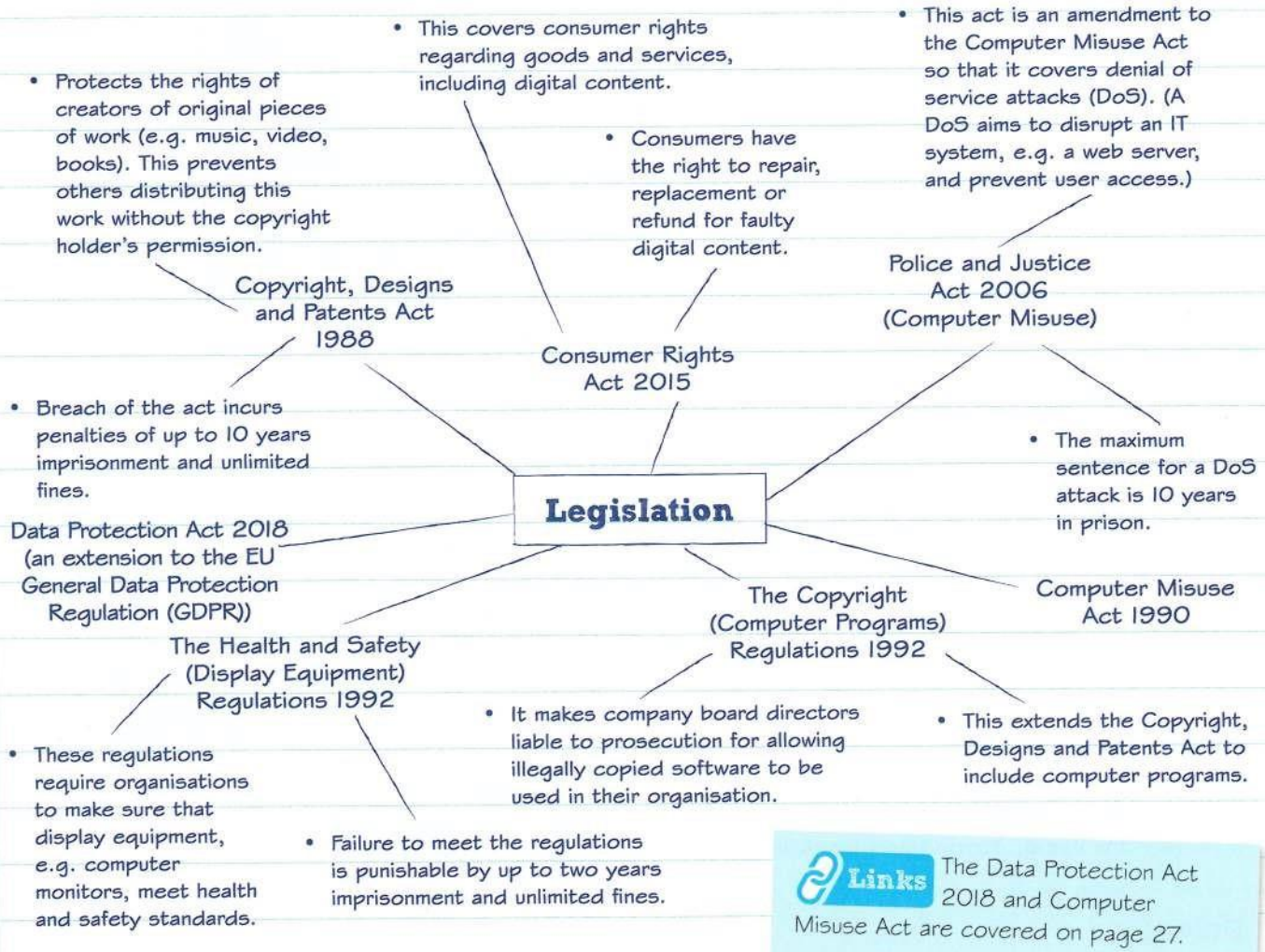
You need to relate each of the issues to the case study given. Copyright, for example, would not be particularly relevant here.

Had a look ☐ Nearly there ☐ Nailed it! ☐

Legislation protecting users and data

You need to know about the role and implications of the main UK legislation for protecting data and users.

Legislation affecting use of IT systems



Links The Data Protection Act 2018 and Computer Misuse Act are covered on page 27.

Why legislate?

- Legislation ensures compliance.
- It encourages and builds trust in systems.
- Ubiquitous computing means our virtual lives are as important to us as our real lives.

Who benefits?

- Individuals – they can trust systems and be sure their personal data is protected.
- Society – the use of powers is transparent and clear.
- Organisations – their reputation is ensured.

Now try this

Simon likes to copy his favourite music from the CD to his computer hard drive so he can listen to it all without needing the discs. He has recently started to upload his music to his own website so others can download and listen to it.

Explain which legislation Simon is breaking and the implications he will face as a result.

Make sure you name the law, describe it and explain the punishment Simon could receive.

Legislation ensuring accessibility

Legislation in IT is not just about protecting users and data. It is also there to ensure that businesses make their systems accessible to all users and that users with disabilities do not suffer from discrimination.

Accessibility legislation and codes of practice

Legislation	Role	Relevance to IT systems
Disability Discrimination Acts 1995 and 2005 Equality Act 2010	Until 2010 the Disability and Discrimination Act was the main legislation banning discrimination on the basis of disability. When it was passed in 2010, the Equality Act brought together and replaced a number of laws, including the Disability Discrimination Act, creating a single legal framework to ensure equality for all. The act applies to both personal life and the workplace.	Under the Equality Act of 2010, website owners and hosts have obligations to make their sites accessible to all. Service providers must provide special computer software or additional staff support to make their systems accessible, at no extra charge.
Guidelines	**Role**	**Relevance to IT systems**
British Standards Institute (BSI) codes of practice	The BSI codes of practice cover a wide range of subjects, including accessibility. They are in place to ensure compliance with legislation.	BSI Standard BS 8878 aims to ensure that web products (e.g. websites, web services and email) are accessible to users with a physical impairment or learning difficulty.
Open Accessibility Framework (OAF)	This European research project sets out a process for ensuring that IT systems are accessible. The framework is broken into steps in two categories: creation of systems, and use of systems.	'Create' steps: 1 Define what 'accessible' means for the particular platform. 2 Provide user interface elements. 3 Provide authoring tools. 'Use' steps: 1 Provide platform supports. 2 Provide accessible software. 3 Provide assistive technologies.
Web Content Accessibility Guidelines (WCAG) 1.0 and 2.0	These guidelines are defined by the World Wide Web Consortium (W3C®) to ensure web content is accessible to all regardless of disability.	The guidelines define three different priority levels for accessibility. Priority level 1 is considered the minimum to allow users with a disability to access a website.

Accessibility and equality

Accessibility isn't about promoting access or giving advantage; it ensures equal access to all, regardless of any impairment or condition. IT and computing offer a great deal by way of assistive technology as far as equality is concerned; so it is essential that this is mirrored within industry.

Now try this

Analyse the impact of legislation and codes of practice on users of IT systems with disabilities.

You need to not just name and describe these, but also look at how they will affect these disabled users.

Had a look ☐ Nearly there ☐ Nailed it! ☐

Your Unit 1 exam

Your Unit 1 exam will be set by Pearson and could cover any of the essential content in the unit. You can revise the unit content in this Revision Guide. This skills section is designed to **revise skills** that might be needed in your exam. The section uses selected content and outcomes to provide examples of ways of applying your skills.

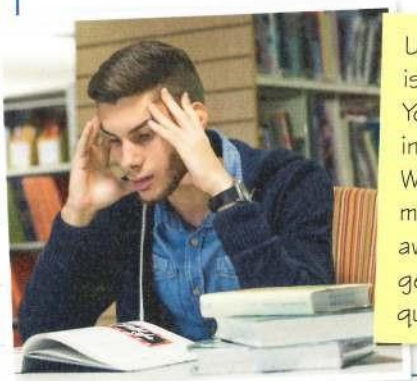
Question types

Make sure you look out for the command words in exam questions, and that you understand what type of answer is expected for each.

Check the Pearson website

The questions and sample response extracts in this section are provided to help you to revise content and skills. Ask your tutor or check the Pearson website for the most up-to-date **Sample Assessment Material** and **Mark Scheme** to get an indication of the structure of your actual paper and what this requires of you. The details of the actual exam may change so always make sure you are up to date.

Practising for the exam



Using practice questions is a great way to revise. You can use the questions in this book, the Revision Workbook and the sample materials provided by the awarding body to really get used to the types of questions you'll be asked.

Worked example

Jonathan is an IT security analyst working for a large e-commerce business. It is his job to ensure that the company adheres to the correct legislation and codes of practice.

Explain the role of **two** pieces of legislation in keeping users' data secure. 4 marks

As this question asks you to 'explain', you need to do more than just name the relevant legislation – make two clear, distinct points for each piece of legislation.

The question also asks you what 'role' the legislation plays – so you need to explain the consequences of it briefly.

Sample response extract

The Computer Misuse Act makes it illegal for people to gain unauthorised access to IT systems and data by making such activities punishable by jail time and a fine.

The Data Protection Act 2018 makes it a legal requirement for businesses to keep users' data secure, accurate and up to date. It punishes businesses that don't comply with massive fines.

You could also mention examples of unauthorised access, such as hacking and spreading malware.

You could also say that a business must only use personal data for clearly specified purposes, or that it must make an individual customer's data available to that customer if they request this.

Links There is more on the Computer Misuse Act and the Data Protection Act 2018 on page 27.

Now try this

State **two** different factors that must be considered when choosing IT systems for the workplace.

Make sure your factors are relevant to the **workplace**.

Links Look at page 14 to revise IT systems in the workplace.

Using case studies

Exam questions may be based on case studies about a business's or individual's use of IT systems. Each case study will give you all the background information you need to answer the questions effectively. Always read a case study carefully as your answers must relate to it.

Why case studies are important

Case studies allow you to apply your knowledge of the unit's content to real-world situations and contexts. This will help you when you move into the working world.

Areas of knowledge you will need to apply

The devices in IT systems
- how devices are used
- the relationships between them

Transmitting data
- connection types
- networks
- the implications

Online IT systems
- online systems and communities
- implications for individuals
- implications for organisations

Protecting data
- implications of storing
- implications of transmitting

Impact of IT systems
- on individuals
- on organisations

Issues involved in using IT systems
- moral and ethical issues
- legislation and codes of practice

Case studies may be shown in a box above the questions, like this. The content of case studies will be different each year and the format may be different. Details of assessment may change so always make sure you are up to date.

Worked example

Thomas is a printer repair technician who travels to offices spread all over London to repair printers.

In order to perform his job he uses a tablet to check his work email for new jobs and to report any updates to his managers.

Describe the role of protocols in allowing Thomas to access his emails. 6 marks

Highlight relevant information

It is a good idea to highlight or underline case study details, as the student has done here, to help you give a specific response to the question.

Here, you could underline the information that Thomas needs to both send and retrieve emails and the device he is using while on the move.

Sample response extract

There are three main protocols used in email systems. SMTP is used to send Thomas's emails from his email client to his outgoing mail server. It also transfers the email between email servers over the internet.

POP3 is a protocol for retrieving emails from Thomas's incoming mail server. It will download the emails from the server to his device so he can read them offline.

IMAP is an alternative to POP3 where the emails are synced between the server and device rather than downloaded, so Thomas would also be able to access the emails on a different device.

Relate each part of your answer to the case study about Thomas.

For this question, applying your knowledge of protocols is quite straightforward. If you were being asked to evaluate, you might need to look at which protocol out of IMAP and POP3 meets Thomas's needs better, so you would need to make sure you fully understand his situation.

Now try this

Olivia is a marketing consultant who has several large organisations as her clients. She has recently started to store all of her clients' information online using cloud storage.

Explain the moral and ethical issues involved in Olivia storing her clients' information on the cloud.

You can gain a lot of information from case studies to help you answer the exam questions. Which key facts would you underline in this question?

Links Look at pages 36–37 to revise moral and ethical issues, and pages 21–22 to revise cloud computing.

Had a look ☐ Nearly there ☐ Nailed it! ☐

Long-answer questions

Here are some examples of skills involved if responding to long-answer questions.

Worked example

Harigotts is an investment company that makes heavy use of IT systems to store data and communicate with customers about their investments and finances.

Analyse the threats to the business when using IT systems in this way. 10 marks

Consider a good range of possible threats to IT systems. The analysis that follows show a detailed understanding of each threat and sets out the answer using a clear structure.

Long-answer checklist

Consider how your response to long-answer questions might show the following qualities:

- ✓ demonstrate accurate and thorough knowledge
- ✓ apply knowledge to the context of the question
- ✓ be well structured and balanced, showing competing viewpoints
- ✓ use technical language accurately
- ✓ if answering 'evaluate' questions, finish with a supported conclusion.

Sample response extract

Malware such as viruses and worms would be a major threat to the data stored by Harrigotts. If a virus infected their systems it could delete the stored data and Harrigotts would lose all the information on their customers' investments. This could lead to losing their customers' investments and would almost certainly result in a loss of business, as customers would be concerned about continuing to invest with Harrigotts.

Another threat could be hackers gaining unauthorised access to Harrigotts' IT systems and modifying or stealing the data being stored. As the company is storing financial information for its customers, this could have severe repercussions, with customers having money stolen from them.

Phishing emails may also be a concern. If Harrigotts are emailing customers regularly, then someone else could send an email to the customers pretending to be Harrigotts. Customers could be tricked into revealing personal information which could be used for identity fraud, such as signing up for loans under a customer's name.

Always relate the threats you have identified to the business in the case study.

Ask yourself, 'How will each threat impact on this particular business?'

Harrigotts may be particularly susceptible to threats because of the financial nature of its business.

Another threat you could mention is accidental damage to the firm's IT systems.

To improve the quality of the response, you could go on to describe aspects of threats such as physical threats, break-ins and/or natural disasters. There might also be internal problems such as employees selling data or using data for another purpose.

Links To revise threats to data, see page 25.

You could structure your answer by examining in turn each of the types of online community the firm is considering.

Now try this

A design firm wants to improve its reputation and increase awareness of the business through the use of online communities. It is considering making use of social networking and blogs for sharing news and interacting with customers, as well as forums for providing customer support.

Evaluate the implications for the firm of using online communities. (For practice purposes, you can just plan your answer using bullets.)

Remember to focus on the firm's requirements: what are the implications of online communities for interacting with customers and providing customer support?

If time is tight, you could list positive and negative implications and then write a concluding summary paragraph.

This is an 'evaluate' question, so make sure you finish with a conclusion or recommendation for the firm.

Links To revise online communities see pages 23–24.

Short-answer questions

Short-answer questions, with command words such as **identify, name, state or give**, want you to give factual information. Answers normally only require a single word or short sentences.

Answering short-answer questions

- Read the question carefully.
- Highlight or underline the key words.
- Write the answers in the space provided.
- Provide enough detail but keep to the point.
- If you have enough time once you've completed the exam, reread your answers to check they make sense and answer the question.

Worked example

Sally runs a wedding photography business. She is considering expanding into new areas of photography and wants to ask customers what photography services they would most like to see.

Name **three** primary methods of gathering information that Sally could use in order to find this out. 3 marks

This is a 'name' question, so the examiner isn't looking for detailed explanation, just for the names of different methods of gathering data.

Simply identify three primary methods of gathering information. You don't need to explain what they are in any detail.

Sample response extract

To gain feedback from customers on the new services she should provide, Sally could use a questionnaire, focus groups or interviews.

The student has clearly identified three methods of gathering primary data.

Worked example

Danek is setting up a home network that will allow him to wirelessly connect his printer to his computer.

State the two types of network that Danek could use. 2 marks

This question is simply asking you to name the appropriate network types. Don't worry about the pros and cons.

Sample response extract

Danek could set up a personal area network to connect his laptop to his printer wirelessly. Alternatively he could use a local area network.

Links To revise types of network see page 17.

Now try this

Adeel has been hired as a graphic designer and his manager has asked him what input devices he will need to complete his work.

Give **three** input devices that Adeel will need.

Links To revise input devices see page 4.

Had a look ☐ Nearly there ☐ Nailed it! ☐

'Draw' questions

If you are asked to **draw** something, you need to demonstrate your understanding by producing a diagram or a flowchart.

Worked example

A bank uses a registration form in order to allow its customers to sign up for its online banking services. The registration form asks for the following information.

Field name	Field length	Data type
Account number	8	Number
First name	25	Text
Last name	25	Text
Date of birth	N/A	Date/Time
Email	64	Text
Password	12	Text

Make sure your drawing includes all the data entry fields shown in the table.

Draw a suitable user interface for the bank registration form. 6 marks

Sample response extract

My Bank plc

Online banking registration form

Please enter your existing account number *This can be found on your latest bank statement*

Please enter your name Forename e.g. John

Surname e.g. Smith

Please enter your date of birth dd/mm/yyyy

Please enter your email address example@mybank.com

Please enter a new password

Please re-enter a new password

Passwords must be between 6 and 12 characters long with a mix of letters and numbers

Validation – 8 characters long, just numbers

Validation – Max 25 characters long

Use date selector – Must be in the past

Validate – Must be of the format <something>@<something>.<something>

Validate – At least 6 characters and less than 12

Validate – equal to first password field

Your user interface could also include:
- instructions for the user on how to complete the form
- appropriate methods to help the user enter their details, such as date picker/calendar for DOB, input mask for password, etc.
- an accessibility feature, such as the 'Listen to this page' feature
- a submit button.

Try to make good use of layout and screen space, and make sure your data entry fields are sized appropriately for their purpose.

You can add annotations to explain features of your drawing.

Links To revise user interfaces, see pages 9 and 35.

Now try this

A business has three computers in its head office which are networked to share documents and to access a single printer.

Draw a diagram of the company's network, identifying all of the devices in the system.

Make sure you:
- identify all the components mentioned in the question
- identify the additional components needed to form a local area network
- draw the components in the right order with lines connecting them.

Links To revise different types of network connections, see pages 15 and 16.

'Explain' questions

Questions that ask you to explain want you to show that you understand the subject and can give reasons to support a view or argument.

Worked example

WireTech Ltd has decided to improve its sales by making use of online communities to share news and information with its customers.

Explain **two** benefits to WireTech Ltd of using online communities to share news and information with their customers. 4 marks

This question requires you to name the methods of communication using online communities, as well as **explain** how they can be used by WireTech Ltd.

Sample response extract

Wiretech Ltd would benefit as their customers would be able to access help and advice online, and they would be able to promote their products online.

This learner has briefly described two different benefits of using communities. However, they have not explained how the benefits would be realised and affect WireTech Ltd.

Improved response extract

WireTech Ltd could make use of social media to build up a following of previous customers, therefore being able to respond to their queries. This would benefit WireTech by being able to be more easily aware of their customers' needs and being more acessible to their customer base. WireTech might also provide a blog or podcasts where they keep customers and potential customers up to date with the company and its products, allowing customers to develop an affinity with the company and potentially boost future sales.

This is a much better answer. The learner has clearly explained how each method identified could be used by WireTech Ltd and what benefit it brings.

Links To revise online communities, see pages 23 and 24.

Now try this

Louise needs to send photo images to her family. She can only do so by email but is unsure which image format is the best to use.

Explain the features of two different image file formats that would make them appropriate for Louise to use for this task.

You need to be confident that you can clearly explain why the features of the two file formats you select make them appropriate for photos to be transmitted as email attachments.

Don't get sidetracked and discuss other methods of sharing photos! Always make sure you answer the question given.

Links To revise file types, see page 11.

Had a look ☐ Nearly there ☐ Nailed it! ☐

'Analyse' questions

Questions that ask you to **analyse** a topic want you to look into it in detail. Break the topic down into its parts and look at the relationship between these parts. This might involve discussing the advantages and disadvantages of possible issues or solutions, but you won't usually be expected to give a conclusion.

Worked example

Hank runs an online business, selling camping and survival equipment. On his website customers are able to purchase products, but first they must register an account using their personal and bank information.

'Analyse' questions may require you to carefully consider a case study. You need to clearly explain the points you are making and always link them to the case study.

Analyse the impact of **two** different relevant laws on Hank's business. 6 marks

For this question you need to:

- identify two laws that are clearly applicable to the case study
- explain each law and show how it will impact on the business.

Sample response extract

There are a number of laws that affect Hank's business. The Data Protection Act 2018, for example, requires Hank to ensure that the personal information he is storing on customers is kept secure. This will affect Hank as he will need to implement a number of security techniques and procedures that could potentially be costly and time consuming.

Another law that Hank is affected by is the Computer Misuse Act. This law makes it illegal for people to gain unauthorised access to Hank's website. This will help Hank's business as it will deter potentially malicious users from hacking his site and stealing, deleting or modifying the personal and bank information that he is storing on customers.

You could also mention other aspects of the Data Protection Act 2018 that will affect Hank's business. For example, the need to clearly specify the purposes for which the business is collecting data and to make sure that the data is only used for these purposes. Any misuse of customers' data would make Hank's business liable to pay compensation.

Links To revise legislation affecting IT systems, see pages 27, 38 and 39.

Now try this

Donna has found recently that the performance of her PC has significantly reduced, especially during the startup process of the PC.

Analyse the role of utility software programs in improving Donna's PC performance. (For practice purposes, you can just plan your answer using bullets.)

In a full answer, you need to discuss utility programs. You would also need to fully explain what role each program will have in improving Donna's startup performance.

Links To revise utility software, see page 10.

'Evaluate' questions

If a question asks you to **evaluate** you need to look at all sides of an argument in order to provide a well-supported judgement on a topic or problem. This normally includes writing a supported conclusion or a recommendation for a solution.

Worked example

Choudhry Solicitors has used the same computers and desktop productivity software since it was founded several years ago. However, the software is now quite dated and the law firm is considering upgrading to alternative cloud-based software.

Evaluate the firm's decision to start using cloud computing productivity software. 12 marks

Evaluate questions require you to look at both sides of an argument. In this case, this involves looking at the pros and cons of cloud computing productivity software.

Sample response extract

Cloud computing would be helpful to the law firm for a number of reasons. Firstly, cloud computing software doesn't put a high demand on the computer's CPU and RAM as it runs on the host's server not the local computer. This will be very helpful as the law firm is using older computers that might not have a high enough specification to be able to run the latest desktop productivity software.

There are a wide variety of pros and cons to cloud computing.

While it is important to mention a range of these, it is more important that you are able to clearly explain the ones you cover in some detail.

Another benefit is that cloud computing supports collaborative working.The firm's employees can easily work on the same documents using cloud computing as they can share access to the files easily.

A disadvantage of cloud computing is that if the firm loses its internet connection, or if the servers of the cloud computing provider go down, then the employees will not be able to access the software and perform any of the necessary office computing tasks.

Make sure you relate the pros and cons of the case study, as this learner has done.

Overall, I believe that the law firm should switch to cloud computing software. The fact that cloud computing software doesn't require a lot of processing power will save the law firm money as they won't need to upgrade their computers. The ability to collaborate between employees will also help make the business more efficient. The issue of not being able to access the software without an internet connection is unlikely to affect the firm much, as long as it ensures a good internet connection.

Make sure you provide a clear conclusion at the end, which should be a logical decision based on the points you have already made in your answer.

Your answer could be improved if you referred to software costs, interoperability, security and training.

Links To revise cloud computing, see pages 21–22.

Now try this

A student is performing research on trends in IT systems and the future of emerging technologies. They are trying to find information on how people are currently using IT in their lives and how IT has changed over the past five years.

Evaluate the use of primary and secondary sources of data in order for the student to carry out this research. (For practice purposes, you can just plan your answer using bullets.)

Remember, you need to look at the pros and cons of each method and to make a clear, well-argued conclusion.

Links To revise data gathering methods, see page 32.